JUN 3 1935

MEDICAL LIBRARY

THE SIGHT-SAVING REVIEW

June, 1935

"Let There Be Sight"

Volume V
Number 2

PUBLISHED QUARTERLY BY
THE NATIONAL SOCIETY FOR THE
PREVENTION OF BLINDNESS, INC.

LEWIS H. CARRIS, *Editor*
ISOBEL JANOWICH, *Managing Editor*

BOARD OF EDITORS

MARY BEARD, R.N.
E. V. L. BROWN, M.D.
A. J. CHESLEY, M.D.
PERCY W. COBB, M.D.
GLADYS DUNLOP MATLOCK
MARY V. HUN
EDWARD JACKSON, M.D.
A. B. MEREDITH
A. L. POWELL
C. O. SAPPINGTON, M.D.
WILLIAM F. SNOW, M.D.
WILLIAM H. WILMER, M.D.
THOMAS D. WOOD, M.D.

The National Society for the Prevention of Blindness presents the articles printed in THE SIGHT-SAVING REVIEW upon the authority of its writers. It does not necessarily endorse or assume responsibility for opinions expressed or statements made. The reviewing of a book in THE SIGHT-SAVING REVIEW does not imply its recommendation by the National Society.

Price $2.00 a year; single copies 50 cents

Published quarterly by the National Society for the Prevention of Blindness, Inc., Office of Publication, 1315 Cherry Street, Philadelphia, Penna.; Editorial Office, 50 West 50th Street, New York, N. Y.

Copyright, 1935, by the National Society for the Prevention of Blindness, Inc. Title Registered United States Patent Office

Application pending entry as second-class matter at Philadelphia, Pa., Postoffice.

PRINTED IN THE UNITED STATES OF AMERICA

The Sight-Saving Review

Volume V Number 2

June, 1935

Table of Contents

PAGE

MEDICAL SOCIAL SERVICE IN AN EYE CLINIC, Amy G. Smith . . 83

FENESTRATION AND NATURAL LIGHTING, Alfred H. Fletcher, Theodore F. Foster, M.D., and Daniel H. Goodnow, Jr. 95

SOME CAUSES OF BLINDNESS, T. H. Farrell, M.D. 108

THE SOCIAL SIGNIFICANCE OF BETTER SIGHT, James E. Ives . . . 116

THE CO-OPERATION OF THE PHYSICIAN AND THE SAFETY ENGINEER IN SAVING SIGHT, C. O. Sappington, M.D., Dr.P.H. 126

ARITHMETIC ABILITY OF SIGHT-SAVING CLASS PUPILS IN CLEVELAND, OHIO, Olive S. Peck 133

EDITORIAL:

July Fourth—A Celebration or a Tragedy? 141

THE FORUM:

Your Child's Eyesight, A. C. Snell, M.D. 142

Communication.—Enforced Wearing of Goggles 146

NOTE AND COMMENT:

Vision and Driving Safety 147

Save the Eyes in Childhood to Reduce Blindness 147

Testing Visual Acuity 148

Eye Hazards in the Oil Industry 148

London Squint Clinic 148

Prenatal Treatment, Visual Safeguard 149

Industrial Safety in Australia 149

Muscle Balance, a Delicate Factor in Performance 149

Reduction of Hereditary Blindness 150

PAGE

Health Education in Rural Chinese Schools 150
National Conference of Social Work 151
New Ophthalmological Society in China 151
Sight-Saving Class in Paris 151
Is Trachoma Infectious? 152
Dr. Wilder Honored 152
Honor for Benefactor to Blind 152
National Society Notes 153

CURRENT ARTICLES OF INTEREST 155

BOOK REVIEWS, by Harry Vanderbilt Würdemann, M.D., John N. Evans, M.D. 158

CONTRIBUTORS TO THIS ISSUE 160

Medical Social Service in an Eye Clinic

Amy G. Smith

THE medical social eye worker is an important agent in the conservation of vision program

NOT so long ago there was only a handful of medical social workers in the whole country engaged in eye social work. In fact, there was not much concern displayed among medical social workers regarding the eye or eye diseases; this seemed a field somewhat removed from other more urgent medical conditions. The wide field of pediatrics, and those fields of medicine that carried a social significance, legitimately claimed their first attention; and medical social workers, not being too plentiful, were soon swallowed up in the other fields of work. Organized groups in the community were at work on programs for conservation of eyesight and prevention of blindness, and were already gathering persons with handicapped vision for follow-up work. It had not been fully demonstrated what a valuable adjunct an eye clinic equipped with social workers could be to this constructive movement in prevention of blindness. Nevertheless, it was a commission for the blind that saw the opportunity to use an eye hospital to further its purposes.

History

The Massachusetts Commission for the Blind had been aroused by the unusually high incidence of blindness in babies in the community and became concerned with the question of cause and prevention. In 1907 it gained permission to install a social worker at the Massachusetts Eye and Ear Infirmary. This was the beginning of the first real eye social work in the country. In this initial step it was clearly stated that the social worker's services were to supplement the medical work for prevention of blindness.

The campaign of education, followed by legislative measures, which was carried on by the Massachusetts Commission for the Blind and the State Board of Health during 1911 and 1912, and even later, for prevention of blindness in babies is now a matter of history. Far-reaching were the ultimate results. The National Society for the Prevention of Blindness, medical societies and local commissions for the blind all took up the cudgels in their fight to do away with this unnecessary evil. What particularly interests us, here, is that in those first five years of social work at the Infirmary the careful investigations made by the social worker of all the circumstances surrounding the birth and eye infections of every baby admitted to the Infirmary proved so illuminating that the study was used as an effective part of the propaganda in this far-flung campaign.

Ophthalmia Neonatorum

But quite aside from all the publicity and activities encompassing this subject was the difficult educational work to be accomplished by the social worker in her intensive work with these cases of ophthalmia neonatorum. The foreign-born mother was prejudiced against sending her young baby to a hospital; she was ignorant of the risks of blindness; it was much easier to believe her baby had a cold and the eyes would soon be well. Foreign mothers nursed their babies, and how would a baby be fed in the hospital if the mother remained at home? There was always difficulty for the social worker who tried to explain to certain parents why they should be examined in a special clinic and perhaps have special medical treatment. As this work progressed, the experiment of admitting the mothers to the Infirmary with their babies was tried. This not only made conditions favorable for the babies' feedings, but it also gave the worker an excellent opportunity to have the mothers examined at the General Hospital and placed under treatment if it was needed. Later, this practice of admitting the mothers was abandoned and the co-operation of the community health nurses was secured so that their visits, with instructions in the homes, would result in the mothers' milk being sent to the Infirmary. This latter plan has continued to our day.

Social Problems

A variety of social problems attended these cases. They were worked out with whatever facilities the community afforded the social worker. As there were but few social workers in maternity work at that time, the worker at the Infirmary had the entire program for the babies' welfare to meet: the after-care when the baby left the Infirmary, placing of babies where problems of illegitmacy made it necessary; and the follow-up of other babies, for months, in their homes. Without a doubt, the lessons the worker gave in the babies' families during those years bore immeasurably good results. Social service records show that the prejudice of foreign mothers about sending their babies to the hospital was broken down and that the social worker's visits were received more and more cordially as time went on. Certain procedures established in that early work have continued to the present day, as they have proved essential for bringing about the best results.

Phlyctenular Keratitis

It was with the advice and co-operation of the medical staff that the worker chose certain eye diseases for intensive social work. Those largely affecting children and young adults were emphasized —phlyctenular keratitis, interstitial keratitis, and ocular tuberculosis were the first conditions chosen, and, soon afterwards, glaucoma was added. Besides the conditions selected for intensive work, a longer list of diseases was chosen for clinic follow-up. This latter group has been changed from time to time (other diseases were added, some classifications, such as industrial eye injuries, were dropped). But, throughout the twenty-five years of work and growth of the social service department, the diseases for intensive work have continued to hold their significant places. As new workers were added to the staff it became possible to enlarge the scope of the work and to establish a clinic follow-up which today includes all of those diseases which would have serious results if allowed to go untreated.

Fifteen years ago the tuberculous child with phlyctenular keratitis was a more serious problem with us than he is today. It was not unusual to find from twelve to fifteen children in the nursery, burying their heads in pillows because of photophobia;

today, one such case would arrest our attention. The disease was more obstinate, recurrences frequent and severe, and children needed to be under medical and social supervision for months, even years. Old social service records indicate that a few of these children, suffering many severe recurrences, died in their early twenties in sanatoria. A six-years' study, from 1923 to 1929, of these children, undertaken by the Massachusetts Eye and Ear Infirmary in conjunction with the Massachusetts General Hospital, gave us many data on the course and treatment of this disease.* During the study the children were seen by the same doctors on each visit. Periodic general physical examinations, intensive home supervision with instructions in proper diet, good hygiene, home investigations to run down any possible tubercular contacts—these were all part of the routine treatment. Frequently, a child was sent to a sanatorium for treatment when positive tests were obtained. For years, we have had the privilege of sending young children with phlyctenular keratitis, coming from poor homes, to a nursery for blind babies (because there were not enough blind babies to fill the beds), and this opportunity has been a boon to our work. There, the very best care has been given under expert medical advice for a long enough time to insure complete physical rehabilitation of the child.

It is not clear why phlyctenular keratitis does not present such a serious problem today as it did fifteen years ago. Community health work has increased in these years; tuberculosis programs involve the supervision of entire families; school medical work and the number of school nurses have increased; health centers are in operation; and we have had periods of prosperity. A social worker told me that years ago it was a common thing for her to see, when visiting schools, children with their feet literally upon the ground, wearing untapped shoes, while she has not seen this condition in recent years.

We know that today there are many children who are not receiving the amount of nourishing food they need. Are we going to have more phlyctenular keratitis as a result? So far, we have not observed any increase in frequency or severity.

* "A Contribution to the Study of Phlyctenular Keratitis-Conjunctivitis," Maud Carvill, M.D.: *Transactions* of the American Ophthalmological Society, Volume 27, 1929.

Interstitial Keratitis

Children with interstitial keratitis are a challenge to any worker. It is estimated that a child with this eye disease loses at least a year at school. It is not so perhaps in every case, but often enough to make it a real problem for adjustment. So much depends upon the parents of these children that it is really a family problem. After the child's eyes have cleared, how often do we find a break in the regular visits to the skin clinic? When the obvious signs of the disease have subsided, many parents take a more sanguine view of the situation and feel that the danger zone has been passed. The subtleties inevitably surrounding the whole subject of interstitial keratitis call for a wealth of resources and a pliability of temper in the worker. The difficulty of obtaining 100 per cent blood tests in the patients' families cannot be reckoned. The question of when, temporarily, to hold up urging these examinations, when to resume action, and when to apply drastic measures with incorrigible patients, keeps a worker alert in her thinking and understanding of the individuals in these families. A father who was bringing his youngster to the eye and skin clinics faithfully, and was on very pleasant terms with the worker, persistently refused to have a blood test himself. On one of the visits he confronted the worker with the remark that Jimmie showed such wonderful improvement since coming to the clinic that he guessed he'd see if he himself needed any treatment.

A surprising amount of success in dealing with this difficult disease attends the capable and earnest worker. Her position of authority in supervising the long treatment in eye and skin clinics (often she must arrange the matter of expense, too,) gives her a place of intimacy in the family. Anxious questions come to her from the parents as to the outcome of their child's eyesight, with the natural fear of blindness hovering in the background. The expressed or hidden feeling of culpability on their part and the consequent remorse increase their respect for her help.

Strabismus

To win the wholehearted co-operation of parents is the crux of the success in children's medical problems. Ignorance, superstition,

suspicion, each and all are actively at work in a parent's seeming stubbornness. Hasn't an ignorant mother said that Tony doesn't need glasses? He will outgrow his cross-eye (strabismus). How much patience and skill are needed to make her understand that after Tony is six years old he will not be able to use both eyes in seeing. Tony will have to go through life with only one good eye, if he does not have treatment now to straighten his cross-eye. Then, there crops up another problem with Tony. Suppose he has gained the name "cock-eye" from his companions; perhaps he retaliates and gets into trouble, or perhaps he grows sullen and withdraws into himself. In either case it will make for a misunderstood, behavior-problem boy if his cross-eye is not corrected. A member of our social service staff, upon her visits one day, met a mother, with two youngsters on foot, wheeling a baby in his carriage. She saw that the mother was cross-eyed, so stopped her. All of the children were cross-eyed, and, in the conversation which followed, the mother said she had had no trouble with her eyes. She was surprised to learn that the children need not remain cross-eyed. Inside of two years all three children were fitted with glasses at the Infirmary.

Sympathetic Ophthalmia

Sympathetic ophthalmia is another disease the significance of which is often difficult to explain to parents. A youngster falls upon a picket fence, a BB gun goes off in his eye, or a Fourth of July firecracker explodes and the lad is brought to the clinic with an ugly wound in his eye. If the doctor advises removing the injured eye to protect the sight of the other, hardly a parent receives this news without questioning. The doctor, with all his knowledge, may not be successful in convincing the parents of the constant danger this diseased eye will mean to the other, even twenty or thirty years hence. He usually turns the job over to the social worker and expects to see the boy in the ward for an operation within the week. A foreign parent may have the hope and a superstition that sight will return to the injured eye if only it is not removed. The shocking thought of losing the eye obscures all suggestions of future danger to the other.

Congenital Cataracts

We have found that sometimes it is an individual outside the family who discovers that a child has something wrong with his eyes, later diagnosed as congenital cataracts. Parents do not want to find defects in their children and persuade themselves that an oddity will disappear in time. I remember a child of four years sent to the Infirmary by a doctor who was called when the youngster fell from a piazza. The doctor discovered the child had congenital cataracts and could not see well, but the family had not noticed this. Here is a disease that calls for repeated operations and needs much interpretation to the family. The results which follow the operations may be good, but the chances are that the child will have handicapped vision, and need follow-up for a long time, mainly to see that proper glasses are worn. He will be sent to a sight-saving class, if this is possible. If none is available, his school teachers will be carefully informed as to his handicap and all that it implies. Even though his vision ultimately is not too bad, he will be limited in his choice of employment throughout his life. The fact that congenital cataracts are thought to be conditioned by lack of certain nutritional values during the mother's pregnancy makes us aware that we should be alert to the possibility of eye trouble in the brothers and sisters of the patient.

Myopia

Not all of the children with myopia need our attention. A large number of them are reporting to an eye clinic each year for a check-up on their glasses. These patients will probably go through life having no difficulty with their eyes and following any trade or profession they are drawn towards. We must not get excited over this group of myopes. But here and there are children with a progressive, degenerative form of myopia, who, if not followed closely and guided in their choice of vocation, will fall by the wayside. After leaving the sight-saving classes, they usually tumble into the first job they can find. If money is sorely needed in the family, it is a hard pull to get them out of an improper job if a suitable substitute is not immediately available. Almost no regular vocational work is being done for these children and, seemingly, by a perversity of fate, the boys are often ambitious

and aim at college and professions. They do not take kindly to or see any advantage in more humble employment. We have started an experiment which we hope will solve the problem as time goes on. By gaining the co-operation of the sight-saving class teachers, a child is observed carefully while he is in school: Is he bright or dull mentally? Is he clever with his hands? Does he show any special aptitudes? In beginning this way, we hope to gauge some of Johnny's ability before the time for work comes, and to learn what type of work is suitable not only to his handicap but to his self-expression.

Tuberculous Eye Diseases

One should speak of the increase of tuberculous eye diseases, tubercular choroiditis, uveitis, sclero-keratitis and conjunctivitis, which the doctors at the Massachusetts Eye and Ear Infirmary are more frequently referring to us in these days. The present economic conditions in our life may be responsible for the increasing number of these patients. After all the medical examinations have been completed on each patient—chest X-ray, nose and throat, dental, old tuberculin skin test—it may be that sanatorium care will be advised. If so, this will prove to be a fairly simple solution of the problem so far as the social worker goes, but sometimes the patient rebels and wishes to remain at home. It is practically impossible to carry on routine treatment in the average home. If the patient is a child of school age, the parents or relatives must be of exceptional intelligence to supervise properly the home treatment. Usually, there is a loss of several months or a year of school work before the doctors advise return to normal activities, and school adjustments must be made. A housewife who is the mother of a little child has a difficult task in carrying on treatment in the home. Household difficulties must be adjusted and, when possible, divided among the members of the family. If the family finances allow, more satisfactory arrangements can be made for the patient. A man who is obliged to give up work and remain at home to carry on routine treatment is usually very unhappy, and recovery is delayed. The loss of work and the increased cost of a special diet are serious problems, and, when necessary, a private or a public relief agency must be asked to give assistance. A patient

who goes to a sanatorium stays there, on an average, from eight to twelve months, with good results. A few patients have improved in their own homes. On discharge from the sanatorium, the patient usually has acquired new habits of hygiene which influence his home living and, in a large measure, make for permanent recovery. We have felt that this group requires a great deal of very careful checking-up after they return from the sanatorium.

Follow-up

Much has been written of "follow-up" in hospital social work. It is generally conceded that for it to be most successful the control must begin with the physician. He, alone, can impress the patient with his sincere interest in the disease and his desire to see him again. The social worker may relieve the physician of much detail in explanation; she can save him much time; but she cannot make up for his thoughtlessness if he neglects to show real interest in his patient. The social worker must see that the patient has an understanding of his medical problem before he leaves the clinic.

Too much emphasis cannot be given to the general physical condition which may be the underlying cause of the patient's eye trouble. Frequently, a patient shows impatience when he comes to the clinic for his eyes and is told he must report to one, two, or three other clinics before the doctor can tell him where lies the trouble. When it is carefully explained to the patient that his eyes are only a part of his whole body and the real trouble may be elsewhere, he will accept all this clinic visiting in search of the focal infection. To help adjust a patient's attitude by giving him an understanding of the medical condition is sometimes the most difficult of a social worker's tasks. It requires intelligence and common sense on the part of the patient; if these are not there in sufficient amount, the worker has to search for some substituting quality to help her in finding an entrance into his mind. A laborer comes to the clinic complaining that he cannot see and wants glasses. It is found he has toxic ambyopia. When he is told he must give up his drinking, what it is doing to his eyes, he still asks for glasses. The chances are that he will try one or two more eye clinics before he settles down to believe what he has been told. When some social upset is at work in the patient's life complicating

his medical condition, it will be revealed to a skilful worker in the course of her interview. The patient must understand his own share of responsibility in the team work with the doctor and social worker, if a successful outcome of his treatment is to be achieved. A follow-up program of this character demands the services of a trained case worker. Even though her services to the patient may seem slight in comparison with intensive case work, it is only when she has this background of training and experience that she can make the most of her interviews, that her judgment will be adequate, that she will win the patient's confidence by giving him the sense of security and soundness which comes from a familiarity with long-time social problems.

Glaucoma

Although a worker's usefulness cannot be gauged by the quantity of work she handles, it may be in the capacity of carrying an intensive follow-up job numbering hundreds of patients that her unique value to the hospital is found. In behalf of these patients she will have a far-reaching influence through her relation to outside agencies, public and private, her contacts with people and groups of people extending over a wide area, to whom her interpretation of the needs of her patients must be given. The glaucoma work which is carried by one worker and a volunteer at the Massachusetts Eye and Ear Infirmary is an example of this follow-up. Over one thousand glaucoma patients went through the eye clinic in 1934. Each patient was interviewed by the worker; each patient received some service from her. As the clinic management and steering of these patients are the worker's responsibility, she has ample opportunities to become acquainted with patients. She interprets the disease and the doctor's orders to all of them. They must know that blindness is inevitable if the disease is not treated. We know that a quarter to a third of all the blindness in the country occurring in people over forty-five is caused by glaucoma, and also that simple chronic glaucoma sooner or later affects both eyes. We know that an operation is sometimes imperative. But there is reluctance on the part of glaucoma patients to accept some of these facts. Especially are they loathe to undergo an operation. Because of the long-continued treatment which is necessary and which does not bring a marked improvement in their sight,

patients become discouraged. Great tact, with honesty, must be exerted to encourage them with their treatments, the worker explaining how important it is to preserve their present sight. We have noted that many glaucoma patients who remain under treatment die before blindness overtakes them. They ask for glasses and it must be shown to them why glasses would not give more vision. A glaucoma patient who has been engaged in a skilled trade and is obliged to give it up and seek employment not requiring good eyesight may become somewhat warped in his outlook. If he has been obliged to give up work altogether, or if he has lost the pleasure of reading, he needs a worker who has a psychiatric point of view, one who can help him accept this hardship. Some glaucoma patients cling to their work, afraid to give it up, and will not give the time to treatment. These patients must be helped to find a way for treatment.

No one social worker, meeting one thousand patients in a year and recognizing the multitude of social problems entailed, could possibly take care of even a small fraction of them herself. She must be acutely aware of the resources the community has to offer. Patients come from a wide radius, city and town, and she has to search for adequate medical treatment for many of them living too far away to make regular visits to the clinic. The transportation from nearby towns of patients with low vision must be arranged. The relative, the social worker, the welfare society, the relief agent, the Commission for the Blind, any person or group best fitted to serve a patient's individual need is called upon. The worker's own situation is one of keen watchfulness that the services needed by her patients are fulfilled. One result from all this interpretation and education sent forth into the community has been an increase in the number of glaucoma patients coming to the clinic. A patient in a distant town has learned through a neighbor what her symptoms may mean and, although she might have blundered into poor medical treatment and in ignorance lost her sight, before it is too late she has been able to find supervised medical treatment for her eye in the clinic.

Dr. George S. Derby

The late Dr. George S. Derby, chief of the ophthalmic staff at the Massachusetts Eye and Ear Infirmary, was vitally interested in

eye social work. He worked to promote its growth and much of its efficiency was due to his direction and enthusiasm. A paper on "Medical Social Service in an Eye Clinic," read by Dr. Derby and discussed by three leading ophthalmic surgeons, contains this statement:

"I venture the assertion that of all the developments of ophthalmologic practice as applied to hospitals which have taken place during the past twenty-five years, this is by far the most important. I believe I do not exaggerate in saying that it has increased the efficiency of the service that we give our patients by fifty per cent at the very least."*

When one considers the advantages of team play the eye social worker engages in today with the community-wide agencies, the opportunities she has for co-operative services with the specialized fields, the fifty per cent increased service to the patients seems a modest estimate.

Prevention of Blindness

A close relationship exists between the eye social worker in the clinic and the prevention of blindness worker in the field. Patients with seriously handicapped vision are in need of long-time constructive plans. The eye worker in the clinic will refer the children who need special educational advantages and are eligible for sight-saving classes to the prevention of blindness worker, who will follow them throughout this schooling. Adults who have lost vision and will become blind, but who are still young and pliable enough to make adjustments in new trades, all need the prevention of blindness worker to tide them over into this new industrial adventure. These latter field workers greatly outnumber the eye social workers, as they must cover large areas of territory in their state-wide program. Today, fortunately, more eye workers are being trained for work in eye hospitals and clinics. We, who have seen so much good come out of eye social work, hope, in the not-too-distant future, to see all the important eye hospitals and clinics in the country equipped with this service as an aid to the medical treatment of eye patients. Its contributing value to the great cause of prevention of blindness is clearly perceived today. The future can only emphasize the facts which all eye workers have believed in for so long.

*Read before the Section on Ophthalmology at the Eighty-Second Annual Session of the American Medical Association, Philadelphia, June 11, 1931.

Fenestration and Natural Lighting

Alfred H. Fletcher, Theodore F. Foster, M.D., and Daniel H. Goodnow, Jr.

THE correct placement of windows for the best use of natural light is a great contribution to eye comfort

JUDGING by the scientific literature on the subject of illumination, the problem of natural lighting has not received from illuminating engineers the attention that artificial lighting has. There has not been very much concern with the efficient utilization of daylight in residences, apartments, schools, offices or factories. The amount of natural light that finds its way in is accepted and then artificial light is added when and where the daylight is insufficient.

Architects, illuminating engineers, and those associated with the window industry in general are apparently just beginning to become interested in increasing the limited scientific knowledge which is available on the vast natural resource of daylight. The rapid development of artificial lighting has perhaps served to distract the attention of architects and engineers from the study of natural lighting.

The use of natural light has held its place through building codes and the conservative custom of putting windows in buildings, both factors being based on our hereditary habit of using the sun as our source of illumination during the day. In recent times there has been discussion about the construction of factories without windows, in which artificial light will be used entirely, and one such structure has already been completed.

History of Natural Lighting*

The problem of admitting daylight to the interior of buildings and still providing protection from the weather was recognized in

* The authors wish to thank Leonard C. Peskin for the many suggestions and references which they obtained from his excellent paper "Past Research in Natural Lighting."

ancient Greece. At Basse, there have been found some remains of roof tiles with open centers, which might have formed small openings for light. It is supposed that the inner columns of the temples supported a sort of clerestory, formed by a channel on each side along the roof. This would give an excellent light, and the statues could be easily protected.

Although it has been ascertained that the Romans understood the manufacture of glass, it is believed that they were not accustomed to apply it as freely as we do to exclude the weather and transmit light. A wooden frame with four small squares of glass and a brass form with movable glass have been found; a piece of glass of considerable size was discovered in one of the walls of a bath.

Italy is credited with having had the first glass windows, next France, and then England. In the Norman architecture of the eleventh century, the windows in small buildings were mere slits in the exterior wall, probably not meant to receive glazing, and opening inward with a wide splay. In larger buildings they were much more important features, being of large size and adorned with columns. Glass was used for windows in private houses in the reign of Henry II of England, about 1177, but was imported. The manufacture of glass was established in England at Crutched Friars in 1557. It was improved in 1635, and was brought to great perfection in the reign of William the Third. It was not until the eighteenth century that flat glass became generally used in windows, and it was during this period that the window glass industry was started in the United States.

Advantages of Natural Light

One of the greatest benefits derived from natural lighting is the esthetic or psychological effect on human beings. Windows usually offer a view of the outside world, and in many cases allow sunshine to enter the room some time during the day. These things, as simple as they may seem, help to make people feel that life is really worth living. We have but to refer to the marked improvement that many convalescents show when they spend the day on porches which are inclosed by windows of common glass which transmit practically no ultra-violet light.

Good lighting promotes physical health directly in such a way that there is no question about its effect. Sunlight, when admitted through open windows, is germicidal, and rooms that are well lighted are usually kept cleaner than those which are dark and dismal.

Buildings equipped with window openings provide a means for ventilation which can be relied upon for changing the air in the rooms in the event of a failure of the mechanical devices for that purpose, or for the rapid removal of noxious gases which may escape in such quantities as to overload the regular ventilation system.

Natural light seems to have an advantage over artificial light in that the human eye and whole sight mechanism is said to be best adapted to it. When natural light is not adequate, it may be supplemented by artificial light. Contrary to a common belief, the two kinds of light can be used together satisfactorily if properly arranged.

Natural light is all that is necessary for the greater part of the time in the majority of schools and factories which are operated during the daytime.

It is hard to realize that a good price is paid for an illumination of less than five or six foot-candles all day when just outside there is available a natural light ranging from six thousand to ten thousand foot-candles.

Natural Lighting in Homes

In moderately priced, single and two-family dwellings good natural lighting is usually obtained. Building codes, housing laws and zoning regulations limit the width of a lot that can be used for the house to provide proper distance between houses as well as the height of buildings to insure good lighting. However, there are factors involved in the window design which tend to complicate matters. Tyler S. Rogers brings attention to the fact that the size, scale, and shape of windows are affected by both the exterior and interior of the house.

The windows in factories, business houses or schools may be scientifically designed even at the expense of presenting a somewhat odd appearance, but not so with the home. Rogers also

points out that window frames are manufactured in standard sizes and that the selection of a special design means additional expense. There is a tendency on the part of contractors to install a poor grade of window glass in homes. This is poor economy, for such glass makes objects outside appear distorted and creates a feeling of dissatisfaction for the tenant.

Building and housing codes in most of our larger cities specify minimum requirements for proper natural lighting and ventilation in apartment and tenement buildings.

Windows serve not only to light the rooms, stairways and halls, but are usually the sole means of ventilation. They also serve to admit noises, and if they are nearer than ten feet to an opposite wall these noises become very undesirable, as they are echoed and amplified.

Development of Natural Lighting in Schools

In 1866 Hermann Cohn suggested, after some studies of ease of reading and actual performance of the eyes, in Europe, that the window area in every schoolroom should be at least one-fifth of the floor area.

Javal, in France, stated that the sky should be visible from every part of the schoolroom and that the school should be separated from neighboring buildings by twice the height of these buildings.

In 1882 the French Department of Education ruled that a section of the sky must be seen equal to thirty square centimeters from the top of the window at each scholar's desk.

Forster, in 1884, suggested that for any desk, the angle between a line drawn from the top of the window and another to the top of the nearest buildings should be four degrees minimum.

In 1883 Weber introduced the photometer as a measure of illumination by comparison of a standard light with the unknown light. After some studies with the Weber Photometer, Cohn concluded that the minimum requirement for lighting a school desk is fifty reduced square degrees of sky vault. The square degrees of sky vault is the area of the sky visible from the desk measured in degrees. The length and width of this sky area visible are measured in degrees of the angle subtended by a point on the desk, and the

length times the width equals square degrees. The reduced square degrees is the square degrees of area multiplied by the sine of the angle of elevation of the visible sky vault. This is due to the cosine law; the sine of the angle of elevation is the cosine of the angle between the normal to the beam of light and the surface of the desk. Cohn computed that a desk having fifty reduced square

A well-lighted classroom.—Beaver Country Day School, Brookline, Mass.

degrees had an illumination of less than one foot-candle in bad weather.

In the United States, proper lighting was emphasized with the issuing of the Code of Lighting School Buildings under the joint sponsorship of the Illuminating Engineering Society and the American Institute of Architects. The joint committee (1926) recognized that the minimum requirements for illumination intensities vary with the type of work being performed.

A recent revision of the code is embodied in *Standards of School Lighting*, published jointly by the Illuminating Engineering Society and the American Institute of Architects, and approved by the American Standards Association. The standards closely follow the "minimum requirements" and "good practices" recently outlined in "A Program of Eye Health in a School System," published by the National Society for the Prevention of Blindness.

The latest recommendation for minimum natural lighting requirements for schoolrooms made in England will be found in the report of a committee of the Illuminating Society of England. This committee recommended a minimum illumination intensity of two and one-half foot-candles daylight for good lighting, and one foot-candle for adequate lighting, with the suggestion that no desk from which no sky is visible is fit for use as a scholar's place. Another committee of the same society recommended five foot-candles for ordinary reading and eight foot-candles for drafting, sewing, etc., as the minimum illumination intensities when using artificial light.

Minimum Light Intensities

Researches in conditions necessary for proper visual functioning have been going on since before 1800. The question of minimum light intensities which permit reading without injury to eyesight, especially for children, remains unanswered, due to the large number of variables involved in the process of seeing.

Dr. L. F. Troland found, from reviewing the literature from the earliest times up to and including the year 1926, that a minimum level of intensity could not be applied equally well to all visual tasks. He concluded, however, that the vast majority of industrial operations, which may also include school work, could be carried out at a maximum efficiency with an illumination intensity of about ten foot-candles. He also noted that many operations where contrasts and sizes of details are not of threshold dimension could be done equally well at one foot-candle. Troland also noted that, in general, past investigations showed increasingly better visual performance as the illumination intensities became higher, provided excessive contrasts were avoided.

Since 1926 Luckiesh, Cobb and Moss have been extremely active

in attempting to put the science of seeing on a rational basis. Cobb and Moss have expressed seeing as a function of the four fundamental factors: size of the object, contrast of the object with background, brightness of the object, and time of exposure of the object.

Doctors Ferree and Rand, of the Wilmer Ophthalmological Institute, have also contributed much excellent information to this important problem.

Window Design

The first experimental work of which we have a record was done by Hermann Cohn in 1866. He suggested that for proper daylighting the window area in every schoolroom should be at least one-fifth of the floor area, and it is interesting to note that the current practice in the United States is in the majority of cases an elaboration of Cohn's suggestion. According to Peskin, another suggestion made by Cohn in 1884, that the visible sky subtended at any desk should not be less than fifty reduced square degrees, is also found in many of the present day codes of lighting.

A good example of a carefully planned, successfully lighted school building is located in the Chestnut Hill section of Brookline, Massachusetts. The head master, and an authority on school construction, explained, in an interview, that before building the school, he studied the schools of several countries, particularly those of Germany. In order to study the best lighting for this latitude and longitude, an experimental room on a double revolving platform was built, and a searchlight was used to represent the sun at different times of the day, at the various seasons of the year. It was found that the east exposure was best for the more important classrooms. Next best was the west exposure. On the east exposure the room was flooded with sunlight early in the morning, and the rest of the day a clear east light was available without glare. A southern exposure was not good because when the sun shines on the pupils, the teacher must pull down the shades and then good lighting is not obtained.

The school was equipped with special wide-mesh, loose-woven, white canvas shades, so that the shades may be drawn to keep out the sun glare without shutting out all of the light. The shades

are arranged so they may be adjusted up or down from the middle of the window.

The windows extend to the very ceiling, and occupy the entire left wall above the desk line, with the exception of seven feet adjacent to the front wall. This exception is made in order to avoid glare on the blackboard, and in order to provide a space into which the pupils may look which is devoid of harsh light. The window supports are narrow to secure the maximum light, and to avoid objectionable shadow bands.

The width of the room is less than twice the height of the windows. By this arrangement the pupils in the row farthest from the windows have satisfactory light, except on dark days when artificial light supplements the natural light. With this requirement in mind, each row of electric lighting units is on a separate switch.

The ceilings are of rough white finish and the walls are light buff. In order to avoid monotony of color in the halls and in the rooms that are used only for short periods, various colors are used for decoration, but white ceilings and buff upper walls are retained. The lower part of the desks, and the floors are of dark color and do not reflect light up into the eyes. This plan is copying nature which provides unreflecting greens and browns underfoot.

There is a desk in the rear of the room for the teacher, so that she also has proper light from the left. Each teacher is instructed not to stand to the left side of the room in front of the windows in addressing the class, because then the pupils must twist in their seats and must face the strong east light if they are to look at the teacher.

There has recently been considerable discussion concerning the use of ultra-violet ray transmitting windows in schoolrooms. It is possible, of course, to obtain pure quartz glass that will freely transmit ultra-violet rays. However, there are certain facts that must be considered. Pure quartz glass is very expensive and glass that can be obtained for this purpose within reasonable limits of cost is at best only sixty per cent efficient and tends to depreciate with use. Dr. Walter H. Eddy, in his work in schoolroom tests in Bronxville, New York, using rats as subjects, found that only those in the direct rays of the sunlight are benefited. Janet Clark,

in a report in 1928, stated that children could get more ultra-violet radiation by being outdoors for a few minutes' recess than all day inside a room behind these windows.

Natural Lighting in Industry

From a code of lighting for factories, mills and other work places, prepared under the sponsorship of the Illuminating Engineering Society and issued by the United States Bureau of Labor Statistics, the following information is obtained: In practice, it will be found that the natural illumination on clear days is frequently many times the amount of actual number of foot-candles needed: in fact, an illumination of a hundred foot-candles can be found in almost any shop if measurements are taken near the window, and very often mechanics find it worth while to avail themselves of this illumination by walking over to the window whenever extremely accurate measurements are to be made. In this connection it is of interest to note that the range of illumination under which the eye can function with some degree of success is extremely wide, varying from a few hundredths of a foot-candle in the moonlight up to as much as 10,000 foot-candles out in the sunlight on a clear day. However, wide extremes in illumination are ordinarily not conducive to best vision.

Most factory owners are particularly interested in making the best possible use of their daylight facilities, so as to render useful and valuable all parts of the floor space; and also to shorten the periods when artificial lighting is needed. The saw-tooth sky windows of modern factory construction permit an adequate and nearly uniform daylight illumination of the entire floor area, and are desirable when practicable. When rooms are illuminated through side windows, it is often difficult or impossible satisfactorily to light all parts of the floor space; one part of the room has too little light, and the other is often subjected to objectionable glare. In some cases the use of prismatic glass which redirects the rays of light so as to admit more daylight into the room, especially into the parts of the room remote from the windows, is worth while. As a rule it is better to confine prismatic glass to the upper sash of the window, as its use in the lower sash is likely to cause objectionable glare; moreover it cuts off all view of out-of-doors.

Windows should be equipped with adjustable devices so that the illumination may be accommodated to the changing exterior conditions. Translucent window shades of light tones constitute the most important of these devices. Window shades or other daylight-adjusting devices should not be left to the mercy of those workers who may be nearest the windows, but should be controlled by the room foreman. He should readjust the window equipment for the varying daylight conditions, and he should also decide when the use of artificial light is necessary to make up for a deficiency in daylight in any location.

Because of the time required for the adaptation of the eye to its surroundings, special danger is present when one steps from outdoor sunlight into a dimly lighted storage space; for example, a passageway connecting two well-lighted areas must be well illuminated. Again, where the eye has been afforded the advantages of a high level of illumination throughout the day and artificial light is turned on to reinforce the failing natural light, a higher total illumination is ordinarily needed than at night under artificial lighting alone.

Luckiesh claims that the omission of windows with the substitution of artificial illumination in the place of natural light will reduce the heating cost in industrial plants. This, however, is somewhat exaggerated, for the average square foot of wall surface in a factory will allow at least one-fourth of the heat loss that a square foot of window will. The wall area involved would serve only for two purposes; thermal insulation and protection against conditions outside. Although the window has only one-fourth of the insulating ability of the wall, it protects against outside conditions to a considerable extent, especially in keeping out the weather, and, in addition, furnishes light and a means of ventilation. The difference between the cost of the natural and the artificial illumination greatly offsets the cost of extra heating. Many factories do not use their heating systems while the machinery is in operation and are glad to have excess heat escape.

Another argument for the exclusion of windows from factories is that undesirable noises will not be emitted from them. From a public health point of view does it not seem inconsistent for men to be exposed to noise so loud that it cannot be tolerated outside

the factory? Such problems should be taken care of by the proper acoustical design of factories and not by window elimination.

The Fenestra Method

The "Fenestra method" is based largely on work done at the University of Michigan by Randall and Martin, who were connected with the Detroit Steel Products Company's research fund established in 1923. They incorporated the theoretical and laboratory studies of Higbie, who was also connected with the research fund work, and their own experimental work, both in the field and in the laboratory.

This method of predetermining daylight consists of a series of tables and charts showing the variation in illumination as one moves away from the windows of various sizes. Illumination values are given assuming the brightness of the window source as two hundred candle-power per square foot inside of clean glass, which brightness is a minimum equivalent to a "gray day," or just before a rain. Correction factors are presented for dirt on glass, and light cut off by structural members. Other variables have been discarded with success in order to keep the method as simple as possible. In application, the minimum daylight at a point in question is given by noting from the tables the cumulative effects at that point of the various contemplated windows.

This method of predetermining daylight is unexcelled at the present time, having been successfully used by such firms as the General Electric Company, Bethlehem Steel Company and the Western Electric Company. It is applicable only to buildings using long lines of windows in large open rooms and, unfortunately, can be used only in the industrial type of building.

The Fenestra method is the most practical and usable one known today as proven by experience; but perhaps the best theoretical analysis of daylighting from windows is the so-called "protractor method" as worked out by Higbie. This method consists of plotting by means of angular co-ordinates the view of the sky, horizon and window as seen from the point in question on a specially prepared ruled paper. The ratio of the area of the paper gives the so-called "daylight factor" at the point, the area of the paper representing the area of the hemisphere of sky.

Location of Buildings with Respect to Natural Lighting

The natural lighting of any building, whether it is a home, office, school, or factory is dependent upon the available daylight. To give buildings adequate daylight it is necessary to space and to construct them properly. A few years ago our larger cities suddenly became conscious of the fact that they were burying their business districts in canyons formed by high vertical walls of skyscrapers. Veiller stated in 1920 that at certain times the Equitable Building in New York cast a shadow about one-fifth of a mile in length, covering an area of 7.59 acres, while the structure itself is only 493 feet high and covers 1.14 acres. He claimed that the shadow cut off all sunshine from the Broadway façade of the United States Realty Building, a structure twenty-one stories high. He also showed how other buildings cast similarly disproportionate shadows. On the street immediately north of the Equitable Building at noon on December twenty-first, not a single window within 447 feet of the street level would receive a ray of sunshine.

In order to check this ever-increasing "darkness," ordinances were passed requiring the new buildings to be set back at various heights. Those constructing the buildings began to realize the advantage of the setback in relation to office rental. The Empire State Building's first setback was made two stories below the required limit for this very reason.

The smaller cities began to feel the need for the regulation of the spacing of buildings and developed ordinances controlling the area on which various types of structures could be erected and also making suitable allowance for light to reach all the rooms.

Summary

Although glass windows came into general use in the eighteenth century, the science of natural lighting did not receive much attention until the last decade.

Hermann Cohn made some good recommendations for window area in schools in 1866.

Since 1926, Luckiesh, Cobb, Moss, Ferree, and Rand have contributed much valuable information in regard to light and sight.

Fairly satisfactory codes for school lighting are now available.

It is of utmost importance that correct window shades be installed and that they be used properly.

The saw-tooth type of factory is one of the best from the point of view of natural illumination.

The "Fenestra method," based largely on the work done by Randall and Martin at the University of Michigan, has proven very successful in the industrial field. Methods should be developed for other types of buildings that would allow natural lighting to be calculated by regular rules.

Building spacing and construction is very important in obtaining the proper amount of daylight.

Some Causes of Blindness*

T. H. Farrell, M.D.

AWARENESS of the more common causes of blindness increases the prevention of blindness worker's power to save sight

WE live in an epoch when men and women are increasingly alive to their responsibilities for prevention of blindness—from birth through the school career, mature life and old age. Those engaged in prevention of blindness work are constantly broadening their understanding of it to include eugenics, dietetics, prenatal care, good lighting, and good printing.

What is Blindness?

The dictionary defines blindness as the state and quality of being blind; that is, destitute of the sense of seeing, either by natural defects or by deprivation. This definition is not especially helpful. The English have a more practical definition, namely: in adults—failure to count fingers at ten feet; in children—failure to read school books. This latter definition is open to criticism, since it would mean sending many children to schools for the blind who simply need careful refraction and proper glasses to give them normal sight, or who should be in sight-saving classes where the sight they have may be utilized to the utmost without causing deterioration.

Hereditary Diseases

Of great importance and interest are those types of blindness which are hereditary. Education and environment have their influence upon the individual during his lifetime, but they do not change his hereditary equipment. In many cases, the only sure way to save children's sight is to choose their ancestors.

* Excerpt from an address, "The Prevention of Blindness Today," presented at the conference of the New York State Federation of Workers for the Blind, Utica, New York.

We know more about hereditary diseases of the eye than those of any other organ, and for the good reason that the slightest defects of the eye cause marked disturbance of function. It is probable that ten of the fifteen per cent syphilitic blind owe their condition to congenital syphilis. The eye involvement shows itself usually between the ages of five and twenty-five. If it takes the form of interstitial keratitis, the child complains of photophobia, with redness and haziness of one or both corneas. After months of treatment, the cornea may become clear and the vision restored. Frequently, the cornea remains hazy and the sight varies from slight impairment to complete blindness. Only recently we saw two children from the same family with this trouble, one seven and the other nine. Wassermann tests of the rest of the family showed the older children free from the disease. The father and mother are now under treatment so that their own eyes may be protected and so that any more babies may be saved from suffering and from defective vision. Fortunately, these two children came through with reasonably clear corneas, though with a permanent disability. Other forms of inherited syphilis are choroiditis, with destruction of the retina; and congenital or juvenile optic atrophy. This disease can be entirely prevented if Wassermann tests are made on all pregnant women and treatment instituted before the fourth month —not by any means an impossible objective.

The genetics of the myopic group have not been fully disentangled, but we may say that dysgenic births are the chief cause of severe myopia; some high myopes go blind and there are many whose very defective vision is almost equivalent to blindness. A possible sequel to high myopia is detachment of the retina, which is the separation of the retina from its choroid bed. Of course, detachment may follow an accident to normal eyes, as well. It develops suddenly and the patient speaks of seeing over a wall, or of a curtain coming up, or down, before the vision of the affected eye. Externally, the eye appears to be normal.

Retinitis pigmentosa is an atrophy of the retina. It begins in early youth and progresses to complete blindness sooner or later—often around the age of forty. A third of those thus affected owe their condition to consanguinity of their parents.

Optic nerve atrophy, in the hereditary form, comes on suddenly

about the age of twenty. It hardly ever leads to complete blindness. It goes under the name of "Leber's disease," and, if once diagnosed, the family should be warned of its hereditary character.

Congenital cataract is usually of the lamellar type. It may occasion sufficient grayness of the pupil to attract attention at birth, or it may not be discovered until the child goes to school. In schools for the blind 13 per cent of the pupils are there because of cataract.

In glaucoma, the hereditary factor is not always very marked, though congenital glaucoma does occur and there is a probable hereditary predisposition to it in many other cases. Two definite types of glaucoma are recognized. The acute one is frequently ushered in by an attack of nausea and vomiting. It has been variously diagnosed as "sick headache" or "blind headache." The eye affected is always darkly congested. Unless it is promptly recognized and an operation performed within forty-eight hours of the onset, it is likely to result in blindness. The other type is one of the most serious of all eye diseases, because it comes on without manifesting either pain or redness. The field of vision gradually contracts and usually the last portion of sight to be lost is good central vision. The patient may be unconscious of this disease until he accidentally covers the unaffected eye and then finds the other is blind. Many people are suffering from this disease, which most frequently occurs after the age of forty. Whatever may be its cause, associated conditions frequently indicate diabetes, liver trouble, arteriosclerosis, kidney disease and high blood pressure, all of which could be recognized early if a thorough physical examination were made at yearly intervals. Persons who test eyes for glasses should be on the lookout for this dread disease and promptly refer patients requiring frequent change of glasses and those having any uncorrectible defect of vision to a competent ophthalmologist.

In all these cases which we have enumerated, where an eye disease, hereditary in tendency, is recognized, the individual should be warned that it may recur in his or her offspring. Unfortunately, that is as far as we are permitted to go at present.

Prenatal Care

Much has been written of the importance of prenatal care. This is of importance not only for the child but for the mother. There is

an increasing number of pregnant women who show evidence of toxemia. Frequent ophthalmic examinations as well as frequent examinations of the urine are important for its early diagnosis. If treatment is not promptly instituted, the vision or even the life of the mother is in danger.

A disease that more than any other in the past has filled our institutions for the blind is ophthalmia neonatorum or "babies' sore eyes." This is not always due to gonorrheal infection but, fortunately, a differentiation, as far as treatment is concerned, is not important. You are all familiar, I am sure, with Crédé's discovery that the use of a solution of one per cent nitrate of silver instilled in the conjunctival sac as soon as the baby is born will almost surely prevent blindness of the newborn. If there is any inflammation in the baby's eyes at any time, a competent eye specialist should be consulted and no pains spared to clear up the inflammation as soon as possible. I understand that the New York State Commission for the Blind stands ready to provide properly trained nurses in case of necessity. The reduction in the number of children afflicted by this disease, in the schools for the blind, from 25 per cent to 7 per cent in the last twenty-five years is a fine piece of work. Of course we should not be satisfied until the percentage approximates zero.

Focal Infection

Focal infection is a prolific cause of eye diseases. In such cases a localized area of disease occurring in remote parts of the body gives rise to an iritis, choroiditis or a retinitis, which may terminate in blindness. The most frequent sites for these focal infections are the teeth, tonsils, nasal sinuses, intestinal tract and the genito-urinary organs. This is only one more illustration of the importance of a periodic health examination. If the dentist should be seen twice a year, surely once a year is not too often for a checkup by the family physician.

Tuberculosis

Another prevalent disease which may involve any part of the eye and yet may not be accompanied by an involvement of the lungs is tuberculosis. It may give rise to phlyctenular keratitis, iritis, retinitis and choroiditis. Though frequently intractable, it is not

so destructive as similar trouble occasioned by syphilitic infection. Many children are seen with photophobia in which the dread of light is extreme—quite as severe as in interstitial keratitis due to syphilis. This may be due to phlyctenular disease of the cornea which is frequently regarded as a manifestation of tuberculosis. If so, it differs from other forms of tuberculosis (as well as from syphilis) in being readily amenable to treatment. Regulation of the diet and attention to the gastro-intestinal tract, with ordinarily good hygienic surroundings, in my experience, have invariably cured these little sufferers—for it is pre-eminently a disease of childhood. If neglected, attacks recur, each one leaving its mark on the cornea in the form of a scar, until the cornea may be so clouded as to impair the vision seriously.

Infectious Diseases in Childhood

The infectious diseases of children have lost much of their importance in relation to blindness. Smallpox is almost unknown in our time, thanks to the prevailing regulation which requires all school children to be vaccinated. Diphtheria can be eradicated if only parents will co-operate with the health department in the use of toxin-antitoxin. Scarlet fever affects the vision only when kidney complications occur. Measles may occasion great discomfort during the onset and height of the disease, but seldom leaves any permanent injury in its train. It may initiate or aggravate symptoms due to eyestrain from refractive errors.

Trachoma

Trachoma is still the chief cause of blindness in some countries. In China, alone, it has been estimated to have blinded one million, affected three to four million in one eye, and to have seriously impaired the sight of twenty million of a population of four hundred million. We are fortunate in this country in having trachoma controlled by the immigration laws which prohibit anyone with trachoma from entering the United States. Despite this, it is prevalent in some sections, especially among the foreign-born and in certain of the Indian tribes. Also, sad to relate, among the mountain whites of Virginia and Tennessee the disease has been propagated because of ignorance and neglect ever since the early settlers found lodgment there.

Cancer

So-called cancer may occur in the eye and is most destructive. The most usual form occurs in adult life as sarcoma of the choroid. It is not suspected until it occasions a defect in the field of vision, recognized by the patient as a cloud which partly obscures the sight. At this stage it may occasion a detachment of the retina, which complicates the diagnosis. If the diagnosis is correctly made and the eye promptly removed, there is no extension. If allowed to remain, the eyeball becomes inflamed and painful and eventually blindness ensues. The last stage is that in which the tumor extends beyond the confines of the eyeball and fills the orbit. It then gives rise to similar growths elsewhere in the body; the disease is fatal. Another form of cancer is carcinoma. If it occurs in the back of the eye, it is, in the majority of instances, secondary to a similar growth elsewhere in the body. Hence, even if diagnosed early, removal of the eye is not attended by such a fortunate result as in sarcoma.

There is still a third form of malignant disease which occurs only in infants; it is called glioma of the retina and in some families is suspected of being hereditary. Parents first notice a yellowish reflex from their child's pupil. This is characteristic of the disease. Early removal is the only hope of saving these children from a horrible death. The only exception to this rule is that, when both eyes are involved, radium may be tried.

Danger of Drugs and Cosmetics

Certain drugs used in medical practice will destroy the sight by causing atrophy of the optic nerve. One of these is quinine in large doses. A similar effect is brought about by certain chemicals used in industry, such as lead and arsenic, also compounds containing tetrachloride used by cleaners and dyers. In this connection we might mention the susceptibility of some individuals to the excessive use of grain alcohol and tobacco, causing optic nerve atrophy. This can be recognized and combatted. The same is not true of wood alcohol, which is acutely destructive of sight and even of life itself.

Of late much has been seen in medical literature of the danger to eyes from cosmetics. These dyes may find their way into the eyes,

setting up an inflammation of the conjunctiva and cornea. If their use is not promptly discontinued and the inflammation properly cared for, blindness may ensue. Other patent preparations for the removal of hair from exposed parts of the body may be very harmful. Such a one is Koremlu, which contains thallium. Being absorbed, it may affect the optic nerve and cause blindness.

Accidents

In the field of accidents the causes are almost too numerous to mention. Flying particles of emery, steel, copper, stone, wood, glass, etc., may lodge in the cornea and if not removed with proper care, may result in ulceration with varying degrees of visual loss. If the foreign body penetrates to the inside of the eyeball and remains there, it is likely to give rise to sympathetic inflammation in the uninjured eye, and may lead to blindness.

Besides the list of articles just mentioned, children's eyes are often injured by sharp-pointed toys and scissors and knives. A case of this kind occurred in our own practice many years ago. A young lad of six years of age was using his mother's scissors to untie his shoelace when they slipped and the sharp point penetrated one eye at the margin of the cornea. The peculiar shape of the pupil attracted the mother's attention and she brought him in for treatment. A simple operation was performed and the eye apparently made a perfect recovery. Some months later the eyes began to have periodic spells of redness and when, finally, the mother brought him back to us, sympathetic ophthalmia was well established. As a result, he lost the sight of both eyes.

We might mention burns of the eye from molten iron and lead; from electric flashes and the acetylene torch; from such chemicals as caustic soda, lime, corrosive acids and tear gas.

Then too, firearms take their toll of sight, especially those used in shooting birds. In our experience, one small birdshot penetrating the eyeball was destructive to sight. Airguns in the hands of children are a frequent cause of eye injury. Of course fireworks have been responsible for many blind or partially blind eyes. Fortunately the long campaign against them is now nearing a successful termination.

Sight Conservation a Hopeful Effort

Safety first campaigns have yielded large dividends in the prevention of injury to the eyes both in the workshop and on the highway. Employers and insurance companies in conjunction with the State Departments of Labor and Compensation have contributed their share in protecting the workers. Goggles are provided for the workmen using grinding machines or emery wheels, where flying particles are a menace to their eyes; and to those exposed to noxious fumes. Properly tinted glasses are supplied for those exposed to the flame of the acetylene torch or electric flashes. The lighting in factories and mills has been improved and care is taken that the individual employee has not only the proper amount of light on his work but that it comes from the proper direction.

Architects and builders are giving more consideration to the problem of proper lighting in the home and in the school. Boards of education, following the lead of the State Department of Education, have accomplished wonders by enforcing a system of school inspection for the detection of visual defects and of contagious eye diseases.

This is but a brief survey of some causes of blindness and the present means of prevention. The biggest problem that confronts us is the elimination or control of the so-called venereal diseases, gonorrhea and syphilis. The joining of medical and social forces in a successful drive against these diseases will in the next twenty or twenty-five years yield results as spectacular as any that have gone before.

The Social Significance of Better Sight*

James E. Ives

EFFICIENCY in production is greatly aided by promoting visual efficiency among workers, according to studies made by the United States Public Health Service

I THINK that I remember having read somewhere that ninety per cent of our knowledge of the outside world comes to us through our eyes. Certainly, our knowledge of the sun, the moon, and the stars comes to us in this way. If it were not for our eyes, the rose would have no color, there would be no greenness to the sea, and not only no blueness to the sky, but there would be no sky. If it were not for our eyes, we should know objects only by their feel, their weight, their odor, their taste, and the noise that they make. The world we build up around us, in our imagination, would be poverty stricken. There would be no sunrises or sunsets, no far horizon on the desert or on the ocean, no brightly colored flowers in the springtime. Our world would be small and gray.

Our sense of sight is the most important of our contacts with the world outside us, and, indeed, with the world of radiant energy in which we "live and move and have our being." We live in a bath of radiation surging around and through us, whose waves range in length from the very short waves of the cosmic rays to the long waves of radio. The radiations of light and heat are perceived by us directly, other forms of radiation only indirectly.

It is seldom that we stop to think how valuable this great gift of eyesight is to us. It is only when something unusual occurs that we awake to its importance. Recently, a dear friend of mine suddenly became blind in one eye through the detachment of the retina from the choroid. We knew that he was a myope, but did

* Presented at the conference of the National Better Light-Better Sight Bureau, New York; published also in a current issue of *Guildcraft*.

not anticipate the catastrophe that has befallen him. Was the myopia produced by too intensive use of his eyes, or by poor illumination, or by both together? Possibly, with better care of his eyes and better illumination, this unfortunate event might have been avoided.

The care of the eyes and proper lighting are very practical matters. As an example, I may mention a recent co-operative study carried on by the Port of New York Authority and the United States Public Health Service. The Port of New York Authority became interested in the possible use of the recently developed sodium vapor lamp in the mid-town tunnel which they are now building under the Hudson River. These lamps have the advantage of being twice as efficient in their lighting output as tungsten lamps, and give a soft, diffused illumination. But the question arose in the minds of the officers of this organization as to the possible injurious effect of the yellow light of these lamps upon the eyes of men employed in the tunnel. They, therefore, suggested to the United States Public Health Service that a study be made to determine the effect of these lamps upon eyesight. A co-operative study was finally arranged, employing, as a Civil Works Administration project, twenty-three men doing clerical work: twelve working under sodium vapor lamps, and eleven under tungsten. The study extended over a period of twelve weeks. Periodic examinations of the eyes were made during this period. No injurious effect of the sodium light on the eyes of the workers was observed, and the men who worked under the light liked it, characterizing it as soft and easy on the eyes. It appears, therefore, that so far as any possible injury to the eyes is concerned, these lamps can be used with safety.[1]

In considering the "Social Significance of Better Sight," I looked up the definition of "social" in Webster's dictionary, and found that the dictionary, in defining this word, says, "of or pertaining to companionship or mutual relationship. . ." The problems of good lighting and protection of the eyes are of mutual interest to us all, as witness the glare of headlights in night driving on country roads; insufficient lighting of roads, especially in the country; and insufficient and improper lighting of our public libraries, schools, workshops, offices and homes. Insufficient or improper lighting in

the schoolroom, such as too small or improperly placed windows, improperly placed blackboards, or insufficient artificial illumination, will produce a strain on the eyes of the growing child and, if the child is naturally myopic, will undoubtedly injure his eyes. The clerk and industrial worker also must have proper and sufficient illumination upon their work if their eyes are to be protected. In this connection, I propose to present for your consideration the results of some of the studies carried on in recent years by the United States Public Health Service on illumination in relation to eyesight in schools and industrial establishments.

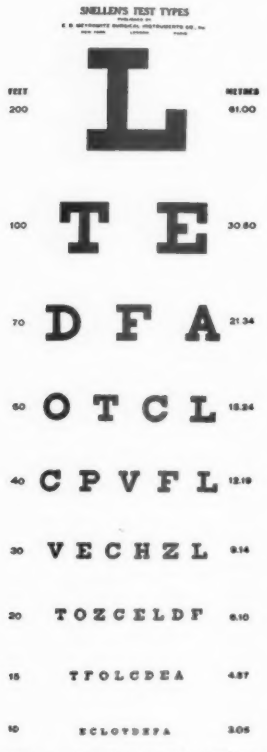


Figure 1.—Snellen Test Card. Reduced to one-sixth of standard size.

The most common method of determining the vision of individuals in large groups is by the measurement of visual acuity with the Snellen test card. On this card (Figure 1) there are successive lines of letters, the letters of any given line being all of the same size and the letters of successive lines smaller than the letters of the lines above them. The subject whose eyes are being examined is placed at a distance of 20 feet from the card, and the examiner determines the line of smallest type that the subject can read. The letters of the successive lines on the card are of such a size that each letter subtends an angle of five minutes at a given distance. Nine distances are used, varying from 200 to 10 feet. Notations of these distances are placed opposite the corresponding lines. If a subject can read the line for 20 feet, his vision is said to be 20/20. If his vision is so poor that he can only read the line for 50 feet, his vision is said to be 20/50. If his vision is so good that he can read the line for 15 feet his vision is said to be 20/15. Vision of 20/20 is taken as a sort of a standard, just as a height

of 5 feet 7 inches might be taken as the standard height for a man. I wish to emphasize the fact that 20/20 vision is not "normal" vision for man, in the ordinary sense of the word normal, any more than a height of 5 feet 7 inches would be the normal height for a man. Men may vary normally in height from 5 to 6 feet, and so visual acuity may vary normally from 20/30 to 20/15 depending upon age, occupation, race, etc. It may be pointed out that visual acuity, as measured with the Snellen test card, is affected by various defects of the eye, such as myopia, hyperopia, presbyopia and astigmatism, and also by the various diseases of the eye. You will realize, therefore, that visual acuity, as measured with the Snellen test card, is a very broad and inclusive, and rather indefinite, index of vision.

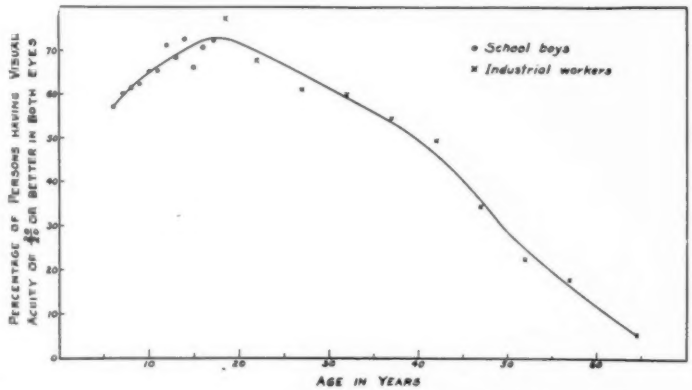


Figure 2.—Variation of visual acuity of children and adults with age.

Figure 2 shows how visual acuity, as measured with the Snellen test card, varies with age. The results shown were obtained from measurements made on some 5,000 white school boys and some 6,500 white males employed in nine different industries.[2] The curve shows the percentage number in each age group of these boys and workers having a vision of 20/20 or better in both eyes. It is evident from the curve that visual acuity, measured in this way, increases, on an average, from six years of age to about 18 years, then decreases rather rapidly to about 43 years of age, and then

more rapidly to about 65 years of age. The curve suggests that there is a normal variation with age, which is more or less independent of the way in which the eye is used and of the degree of illumination under which work is performed. The average visual acuity of a group of individuals of a given age, having normal vision, and living or working under conditions not involving intensive use of the eyes, might perhaps be taken as the "normal" visual acuity at that age. The increase of visual acuity from birth until about 18 years of age, shown in Figure 2, is very significant.

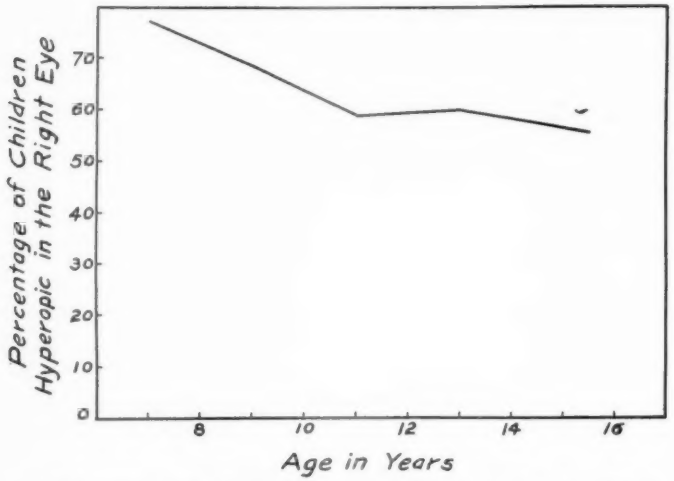


Figure 3.—Prevalence of hyperopia among school children of different ages. The data refer to the right eye, but the left eye shows approximately the same results.

This increase of visual acuity during the early years of life certainly cannot be attributed to either the goodness or poorness of the illumination under which children live, play and work. It is due primarily to the fact that at birth the eye of the child is highly hyperopic and that this hyperopia diminishes as the child grows older. The high incidence of hyperopia in the young child and its decrease as the child grows older is shown clearly in the curves of Figure 3, which give the results of a study of white school children in Washington.[3] It will be seen that the number of children

having hyperopic eyes decreased from about 80 per cent at seven years of age to about 55 per cent at 15 years of age.

In Figure 4, the 6,500 white workers whose average visual acuity is shown in Figure 2 have been separated by occupations,[4] and the curves show not only the decrease of visual acuity with age, but the effect upon visual acuity of occupation. It will be noted that

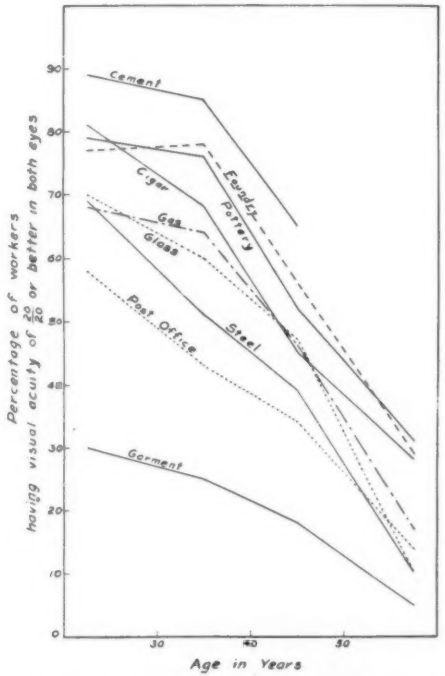


Figure 4.—Variation of visual acuity of industrial workers with age for different occupations.

in occupations such as the cement, foundry and pottery industries, industries requiring only a small amount of concentration of vision, the average vision is very much better than in an occupation such as the garment industry, in which great concentration of vision is required. In the latter industry, the low level of vision may be due either to insufficient illumination or to the nature of the eye

work, or to both. It is very evident, however, that as high a level of illumination as possible should be provided for eye work in an occupation, such as that of the garment workers, in which great concentration of vision is required.

Besides the points brought out by studies of visual acuity, studies made by the Public Health Service have shown three important relationships between illumination and eyesight.

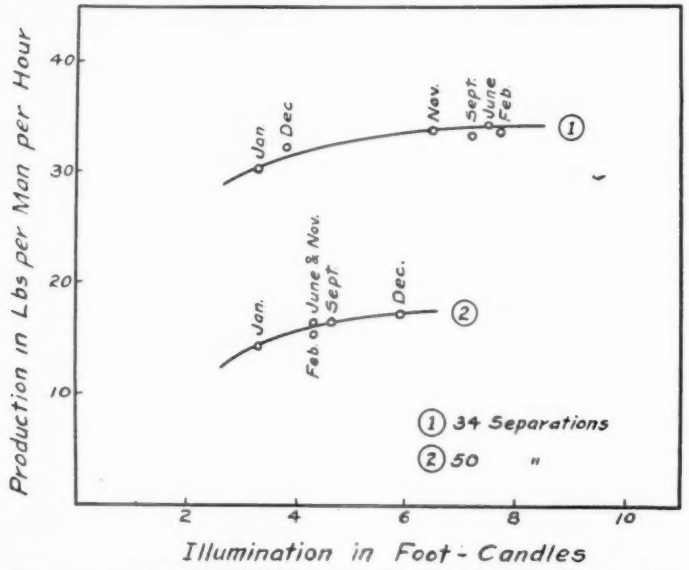


Figure 5.—Relation of production to intensity of illumination in the New York City Hall post office.

1. Increase of illumination increases production.
2. Increase of illumination increases the normal visual acuity of the worker.
3. Increase of illumination decreases the incidence of eye defects.

The effect of increased illumination on production is seen in Figure 5, which shows the results of studies made in the New York City Hall Post Office on the effect of increased illumination on the amount of mail sorted by letter separators.[5] The curves of this figure give the results of tests made for two different types of

sorting of mail. The upper curve gives the results for work necessitating 34 separations of mail, and the lower curve for work necessitating 50 separations. In both cases it is evident that there was a marked increase in the amount of mail sorted per man per hour as the intensity of the illumination was increased.

Even more interesting than the effect of increased illumination upon production is its apparent effect upon the everyday visual acuity of the men working under it. This is shown in Figure 6, which is taken from a report on a study made at the Chicago Post Office.[6] The method of measuring visual acuity used in this study was somewhat different from that of the Snellen test card, since

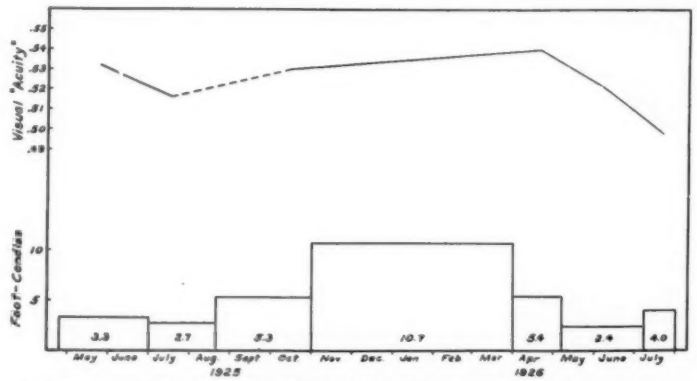


Figure 6.—Effect of intensity of illumination upon everyday visual acuity.

in this study we used as the test object the international broken circle, exposed only for about one-hundredth of a second. The tests extended over a period of about fifteen months. It will be noted that when the illumination under which the subjects worked was decreased, their everyday visual acuity decreased, and when the illumination was increased their everyday visual acuity increased. These results, therefore, appear to indicate a definite relationship between a worker's everyday visual acuity and the illumination under which he works.

The effect of the intensity of illumination on the incidence of eye defects is shown by the studies on lighting carried on in the New York Post Offices.[7] Two post offices, differing markedly in levels of

illumination, were chosen for the study—one, the City Hall Post Office, which was old and in which the lighting was antiquated, and the other, the General Post Office, which was relatively new at that time and in which the general level of illumination was higher. The two post offices were comparable in the age distribution and years of service of the employees. The prevalence of defects and diseases of the eye was in general found to be much greater in the City Hall Post Office than in the General Post Office. A comparison of certain eye conditions in the two post offices is shown in Figure 7. It will be noted that the percentage of employees having certain defects of vision was much greater in the older post office, and also that the percentage of employees having 20/20 vision was in general greater in the newer post office.

Post office.	Normal vision in both eyes with no defects.	Normal vision in both eyes with defects.	Normal vision in one eye only.	Normal vision in one or both eyes.	Defective vision in both eyes.	Refractive errors.	Inflammatory conditions.	Muscular unbalance.	Asthenopia.
City Hall	10.3	29.5	17.8	57.5	42.5	76.6	20.9	33.4	16.5
General	19.8	29.9	17.6	67.4	32.6	72.5	11.9	22.4	5.7

Figure 7.—Percentage of the 2,449 employees examined in the New York City Hall and general post offices, with certain eye conditions.

The material that I have presented for your consideration will indicate the great interest taken by the United States Public Health Service in the provision of sufficient and proper illumination in the home, the school, the workshop and the office, for the protection of the most valuable possession of our fellow citizens—our eyesight.

Bibliography

1. Ives, James E.: Effect on the Eye of the Yellow Light of the Sodium Vapor Lamp, *Public Health Reports*, Reprint No. 1640, Washington: Government Printing Office, 1934.
2. Collins, S. D., and Britten, R. H.: Variation in Eyesight at Different Ages, as Determined by the Snellen Test, *Public Health Reports*, Reprint No. 979, Washington: Government Printing Office, 1925.

3. Kempf, G. A., Jarman, B. L., and Collins, S. D.: A Special Study of the Vision of School Children, *Public Health Reports*, Reprint No. 1235, Washington: Government Printing Office, 1929.

4. Britten, R. H., and Thompson, L. R.: A Health Study of Ten Thousand Industrial Workers, Public Health Bulletin No. 162, Washington: Government Printing Office, 1926.

5. Ives, James E.: Study of the Effect of Degree of Illumination on Working Speed of Letter Separators in a Post Office, *Public Health Reports*, Reprint No. 973, Washington: Government Printing Office, 1925.

6. White, L. R., Britten, R. H., Ives, J. E., and Thompson, L. R.: *Studies in Illumination.* II. Relationship of Illumination to Ocular Efficiency and Ocular Fatigue Among Letter Separators in a Chicago Post Office. Public Health Bulletin No. 181, Washington: Government Printing Office, 1929.

7. Thompson, L. R., Schwartz, L., Ives, J. E., and Bryan, N. P.: *Studies in Illumination.* I. The Hygienic Conditions of Illumination in Certain Post Offices, Especially Relating to Visual Defects and Efficiency, Public Health Bulletin No. 140, Washington: Government Printing Office, 1924.

The Co-operation of the Physician and the Safety Engineer in Saving Sight

C. O. Sappington, M.D., Dr.P.H.

THE collaboration of the industrial physician with the safety engineer is required for an efficient program of sight conservation in industry

A GREAT deal of attention and time have been given to the gathering of figures regarding the occurrence of eye injuries and the cost of them. It seems useless to take up time and space and quote such statistics further. It is significant that more money is paid each year by employers in compensation for eye injuries than for injuries to any other part of the body. It should also be emphasized that the value of sight makes an injury to the eye a very costly single item.

For the purpose of this discussion, injury means not only the results which take place mechanically but also those which occur from exposure to excessive light and heat, various poisons, chemical and heat burns, excessive eyestrain, and improper lighting.

It may be obvious, but one may well risk repetition in stating that the principles of sight saving should properly include a knowledge of the effect of general systemic body conditions on the eye, the intelligent exercise of care in the use of the eye under varying conditions, in addition to the provision of protective measures against the well-known kinds of eye injuries.

We, therefore, have for our consideration a very broad problem. In the approach to the discussion of this problem it seems wise to include a discussion of what the physician should know; what the safety engineer should know; the essentials of co-operative effort; the practical results that may be achieved, and the conclusions which may be reached through a discussion of these sub-topics.

What the Industrial Physician Should Know

Perhaps at the outset it would be well to agree that every plant physician cannot be an eye specialist; but it is of equal importance to assume that every plant physician should be able to recognize (before it is too late) a dangerous reaction, necessitating the immediate service of a skilled ophthalmologist. Herein, I believe, lies one of the essentials of the prevention of loss of sight.

It seems reasonable to expect the physician to know what the ordinary eye injuries are, such as cuts, piercing wounds, contused wounds, burns; how they are caused; and their effects and treatment. The physician should also have a knowledge of the diseases caused by excessive eyestrain—such as nystagmus, spasm of the ocular muscles, and the results of eyestrain encountered in occupations requiring prolonged use of the eyes. Excessive exposure to light and heat, such as in welding, in glasswork and furnaces, in the constant gazing at bright objects, and in the exposure to electric flashes, affects the eyes. Certain poisons affect the vision, such as methyl alcohol, amyl alcohol, tobacco, arsenic, carbon bisulphide, lead, materials used in the manufacture of explosives, aniline, and the occupation of tea-tasting.

It also seems wise that the physician should know what the possible hazards to the eye are in the processes and the use of materials in the plants where he is the medical supervisor. In this way he may, in his co-operation with other plant officials, approach the problem of prevention of eye injuries in an intelligent way.

As an example of the specificity of eye injuries and their complications, Dr. Paul D. Moore, in an excellent discussion of eye injuries and their treatment, has called attention to the various degrees of injuries which may result from a single accident due to mechanical causes: (1) the cornea only may be cut through; (2) in addition to cutting the cornea, the iris may be cut and a portion of it dragged out through the corneal wound; (3) the lens may be punctured, resulting in a cataract; and (4) the foreign body may enter the posterior chamber of the eye. In the further discussion of other types of eye injuries Dr. Moore comes to the reasonable conclusion that every eye accident is a distinct problem in itself as to treatment and result.

The question of goggles has been one of great interest and much has been written and said on this subject. The physician surely should have a reasonable knowledge concerning the proper use of goggles, and their selection and adaptation to various plant problems.

What the Safety Engineer Should Know

As an excellent basis for the acquisition of further knowledge on eye protection by the safety engineer, the National Safety Code for the Protection of Heads and Eyes of Industrial Workers can profitably occupy our attention. The results of twenty years' study of eye injuries, covering nine general groups of processes and operations, are given in this code, as follows:

Group A—Processes where protection from relatively large flying objects is required. Examples: Chipping, calking, and some riveting operations.

Group B—Processes where protection from dust and small flying particles is required. Examples: Scaling and grinding of metals, stone dressing, and some woodworking operations.

Group C—Operations where protection from dust and wind is required. Examples: Automobile driving, locomotive driving and firing, and electric spot and butt welding, where there is no exposure to radiant energy.

Group D—Processes where protection from splashing metal is required. Examples: Babbitting, pouring of lead joints for casting iron pipes, casting of hot metal if there is a possibility that water is present; and dipping in hot metal baths.

Group E—Processes where protection from gases, fumes, and liquids is required. Examples: Handling of acids and caustics, dipping in galvanizing tanks and some japanning operations.

Group F—Processes where protection from an excess amount of dust and small flying particles is required. Example: Sandblasting.

Group G—Operations where protection is required from reflected light or glare. Examples: Long exposure to snow-

covered ground, exposure to reflected sunlight from roofs, roadbeds, etc.

Group H—Processes where protection from injurious radiant energy with a moderate reduction in intensity of the visible radiant energy is required. Examples: Oxyacetylene and oxyhydrogen welding and cutting; open-hearth, Bessemer, and crucible steel making; furnace work, electric resistance welding, brazing, and testing of lamps, involving exposure to excessive brightness.

Group I—Processes where protection from injurious radiant energy with a large reduction of the visible radiant energy is required. Examples: Electric arc welding and cutting.

It is acknowledged that the examples given in this list are merely for illustration and are not intended to cover all contingencies. For instance, it is stated that goggles alone will not furnish proper protection for all the occupations listed in this brief grouping; in some processes, for example, a mask is necessary to protect both face and eyes; in sandblasting, helmets of special design are used, and in other instances gas masks or respirators are advisable in addition to specific types of goggles.

The safety engineer should certainly know what the processes are in his plant, and of the materials which are used, which might give rise to an accident affecting the eyes. He should likewise be acquainted with the different types of protective devices and their specific uses. He should give due consideration to the principles of lighting and their adequate application to the various sections of his plant. From time to time he should arrange meetings at which the revision of processes, the changing of methods, or improvement in lighting might be discussed with department heads and officials.

The safety engineer should not be required to know anything about various diseases of the eye, nor should be concern himself about the medical and surgical treatment of eye injuries and their complications—this is quite properly the province of the physician. The safety engineer can, however, discourage all attempts by employees to treat eye injuries in any way and he can be an excellent and outstanding example of this principle himself—not forgetting, however, that there are a few very simple first-aid procedures, care-

fully selected, which may be of value, especially when agreed to by the attending plant physician or the eye specialist who is regularly engaged by the plant.

Essentials of Co-operative Effort

In 1929 it was my privilege to give an address on the general subject of "Co-operation in Industrial Health Work." Some of the statements made at that time with regard to participation of the physician and the safety engineer in this type of endeavor are still valid and may be referred to here.

The industrial physician is the professional technician in the field of industrial health endeavor. He must realize that special training and experience are necessary for the fulfillment of his proper function in industry. This implies not only a knowledge of checking up injury cases, but adequate studies of working conditions and medical procedures to the end that the prevention of injury and illness become a first principle. The doctor should be a party to all investigations, hearings, examinations, and proceedings which have to do with accidents and sickness.

The safety engineer is the lay technician among the personnel of industrial health workers. He should be informed upon the technical aspects of the control of various industrial accidents and health hazards and must keep himself informed of progress in this specialized field, because it is to him that the management comes for the solution of such engineering problems. The safety engineer must co-operate actively with the plant physician in working out methods of protection for the employees; usually the safety engineer is well trained in the engineering aspects of industrial hygiene, but he must not assume the prerogatives of a physician who concerns himself directly with the effects of various accident and health hazards upon the human body.

It is only through a smoothly functioning and co-operative relationship that the plant physician and the plant safety engineer can be of greatest value in their respective fields. Specifically, the physician and the safety engineer should meet at regular intervals, and analyze carefully the various factors responsible for the production of injury and deleterious effects to the eyes of the employees. The next step is the correction of conditions which bring

about the situations injurious to eyesight. Following this, an attempt should be made to ferret out all potential hazards, study them carefully, and correct them before an injury occurs. Merely stating these apparently obvious principles is simple enough in itself, but to get the proper results demands the constant vigilance of everyone connected with the plant.

One item of importance which may be easily overlooked is the instruction and constant reminding of employees by management, physician, and safety engineer. Too often in co-operative relationships the employee is forgotten. It is not appreciated how vital a part the employee plays in the prevention of injury and how, if properly handled, he may become the deciding factor in the control of accidental injuries.

Results to be Achieved

The possibilities for saving the eyes through the use of the suggestions made herewith will go as far as one's imagination may allow. Such results may be expressed in terms of eyes saved, which is the most important result, and in terms of money saved as well.

Quite likely there are many excellent examples, but two will be reported briefly: the Pullman Company, for instance, discovered that since they have had a special program of eye conservation, 122 eyes of workers and about $250,000 in compensation and medical expense were saved in six years. The Dominion Forge and Stamping Company of Canada learned that before an effective program was started, the cost of eye injuries averaged $1,668 per year; later this amount was reduced to $88 and subsequently to $10 per year.

Conclusions

Eye injuries constitute the most costly type of accidental injury in industry today.

The basis for the co-operation of the physician and the safety engineer in the prevention of eye injuries and the saving of sight should be a very definite realization on the part of both that special training and experience are essentials in the achievement of desired results. In working out co-operative relationships, a practical con-

sideration is the frequent interchange of ideas and experience. It is never necessary that the personality of either of these important individuals be submerged—their respective abilities should be complementary and their attitudes complimentary.

Perhaps it is an ideal consummation—but one has only to read the records of eye injuries and of the tremendous wastage and loss of sight to hope that in the future not only will the physician and the safety engineer, but all who have any relationship to industry, be fired by the same ambition and dominated by the same high purpose—the prevention of eye injuries and the saving of sight.

Arithmetic Ability of Sight-Saving Class Pupils in Cleveland, Ohio

Olive S. Peck

AS in reading achievement, sight-saving class pupils are on a par with normally seeing children in learning arithmetic processes, provided sufficient time is allowed for them to compensate for their visual handicaps

SINCE January, 1932,* the Stanford Achievement Test in Reading has been given annually to every sight-saving class pupil in Cleveland. This testing program has seemed to aid the teachers in measuring the effectiveness of their teaching methods and has helped the administrators in the proper grade placement of the pupils.

In view of the successful results attained through the use of the data afforded by the reading tests, it was decided to reproduce in large type the Stanford Achievement Tests in Arithmetic. Permission was generously granted by the publishers of the Stanford Achievement Tests to reproduce Form W of the Arithmetic Test for use in the sight-saving classes of Cleveland. The test is in two parts—Arithmetic Reasoning, and Computation.

The test was given in June, 1933, to pupils from 4B through 9A. It was repeated in June, 1934. All of the testing was done by the writer to secure uniformity in administering the tests. The achievement of individual pupils was graded by the teachers. Combined scores for each grade group were made by the writer. The median, or mid-score of all the individual scores arranged in order of size, was selected to indicate the standing of the class as a whole. For convenience in comparing the pupils' achievement in arithmetic with their intelligence quotients, arithmetic quotients were also

* See SIGHT-SAVING REVIEW, Vol. III, No. 2, June, 1933.

computed. The latter are derived by finding the percentage ratio of actual achievement of sight-saving class pupils to standard achievement of pupils in the regular classes (i. e., the class norm reported by the author of the tests).

One advantage of having individual scores made up by the teachers is that in checking the papers the teacher notes the parts

Table I

SUMMARY OF RESULTS IN ARITHMETIC REASONING AND COMPUTATION TESTS GIVEN TO SIGHT-SAVING CLASS PUPILS, CLEVELAND, OHIO, JUNE, 1933*

Number pupils tested	Grade	Author's class norm (regular grades)	Median class standing of sight-saving class pupils			
			Arithmetic reasoning		Arithmetic computation	
			Regular time	Time and a half	Regular time	Time and a half
25	4B	4.4	5.4	5.6	4.7	4.7
15	4A	4.9	5.6	5.6	5.0	5.0
19	5B	5.4	5.3	5.3	5.4	5.4
23	5A	5.9	5.9	5.9	6.0	6.3
14	6B	6.4	7.4	7.4	8.0	8.0
13	6A	6.9	7.6	7.6	9.3	9.3
15	7B	7.4	7.8	7.8	8.3	9.2
13	7A	7.9	7.6	7.8	9.3	9.5
13	8B	8.4	8.3	8.3	8.8	8.8
12	8A	8.9	8.3	8.3	9.7	9.7
17	9B	9.4	8.6	9.0	9.9	10.2
10	9A	9.9	8.1	8.1	10.0	10.0

* Comparison of median achievement scores of pupils in sight-saving classes with scores of pupils in regular grades (author's class norms) for arithmetic reasoning and arithmetic computation tests, by grade—allowing regular time and time and a half.

of the test in which the pupil succeeds or fails. While these tests are only slightly diagnostic, they become more so for teachers doing individual work, as sight-saving class teachers do, if the teacher knows what each pupil does on the test.

The question of the amount of time to allow on the test came up just as it did in giving the reading tests. It was decided again to allow time and one-half. This was an arbitrary decision as the exact amount of time needed would depend on the individual eye

condition. The authors of the test allow enough time for pupils to work up to their mental level. It was thought that time and one-half would allow sufficient time so that the sight-saving class pupils could attain their mental level in spite of the loss of time involved because of vision defects.

Table II

SUMMARY OF SCORES IN ARITHMETIC TESTS—CLASS STANDING AND ARITHMETIC QUOTIENT—GIVEN TO SIGHT-SAVING CLASS PUPILS, CLEVELAND, OHIO, JUNE, 1933*

Number pupils tested	Grade	Author's class norm (regular grades)	Median score of sight-saving class pupils		
			Complete test—time and a half		Intelligence quotient
			Class standing	Arithmetic quotient	
25	4B	4.4	5.0	108	98
15	4A	4.9	5.0	101	99
19	5B	5.4	5.2	100	92
23	5A	5.9	5.8	101	94
14	6B	6.4	7.7	109	94
13	6A	6.9	8.3	105	99
15	7B	7.4	8.5	103	91
13	7A	7.9	8.3	100	91
13	8B	8.4	8.5	101	92
12	8A	8.9	9.2	109	95
17	9B	9.4	9.4	99	94
10	9A	9.9	8.9	94	94

* Comparison of median achievement scores of pupils in sight-saving classes with scores of pupils in regular grades (author's class norms) for combined reasoning and computation tests in arithmetic, by grade—allowing time and a half.

Comparison of arithmetic quotients of sight-saving class pupils with their intelligence quotients, by grade.

Tables I and II show the results of the 1933 test. A comparison (see Table I) of the median class standing for the extended time with the author's class standing shows that the median sight-saving class standing compares favorably, on the whole, with achievement of pupils in regular grades.

A comparison (see Table II) of the median I.Q. with the median arithmetic quotient shows that these pupils are working up to

their mental capacity. The intelligence quotients were arrived at by individual Binet Simon tests given by a clinical psychologist.

A comparison of the medians on the reasoning and computation tests shows that on the reasoning tests the pupils were limited by the level of their mental ability while the results on the computation tests indicate good teaching. In the primary grades pupils were limited on the computation tests because of certain processes and technique of arithmetic which they had not been taught.

Table III

SUMMARY OF RESULTS IN ARITHMETIC REASONING AND COMPUTATION TESTS GIVEN TO SIGHT-SAVING CLASS PUPILS, CLEVELAND, OHIO, JUNE, 1934*

Number pupils tested	Grade	Author's class norm (regular grades)	Median class standing of sight-saving class pupils	
			Arithmetic reasoning	Arithmetic computation
18	4B	4.4	4.9	4.5
20	4A	4.9	5.0	4.6
26	5B	5.4	5.7	5.8
16	5A	5.9	6.1	6.3
18	6B	6.4	6.4	6.3
22	6A	6.9	7.1	8.3
15	7B	7.4	8.4	9.0
17	7A	7.9	7.8	8.0
14	8B	8.4	8.9	8.9
14	8A	8.9	9.9	9.9
15	9B	9.4	8.7	9.9
11	9A	9.9	9.4	10.0

* Comparison of median achievement scores of pupils in sight-saving classes with scores of pupils in regular grades (author's class norms) for arithmetic reasoning and arithmetic computation tests, by grade—allowing time and a half.

While there seems to be little gain (Table I) in the median class standing in reasoning through giving time and one-half for the test, the gain is more apparent in the computation test. Evidently, sufficient time is allowed in the reasoning test for pupils to work up to the limit of their mentality. In the computation test the pupils show the results of good training in arithmetic technique and, through having extra time, were able to raise their standings.

On the basis of average class standing not much gain is shown in the medians but, from the standpoint of the individual pupil, the extended time makes quite a difference. A study of the individual results shows 42 pupils out of 189 gained from one month to two years and four months in class standing. The average gain for the 42 was 4.7 months. Since we are interested chiefly in the individual

Table IV

SUMMARY OF SCORES IN ARITHMETIC TESTS—CLASS STANDING AND ARITHMETIC QUOTIENT—GIVEN TO SIGHT-SAVING CLASS PUPILS, CLEVELAND, OHIO, JUNE, 1934*

Number pupils tested	Grade	Author's class norm (regular grades)	Median score of sight-saving class pupils		
			Complete test—time and a half		Intelligence quotient
			Class standing	Arithmetic quotient	
18	4B	4.4	4.7	110	95
20	4A	4.9	4.9	102	92
26	5B	5.4	5.6	102	93
16	5A	5.9	6.4	113	101
18	6B	6.4	6.3	102	92
22	6A	6.9	7.7	104	96
15	7B	7.4	8.9	115	97
17	7A	7.9	8.0	97	94
14	8B	8.4	8.9	106	92
14	8A	8.9	9.9	109	92
15	9B	9.4	9.3	107	95
11	9A	9.9	9.5	98	96

* Comparison of median achievement scores of pupils in sight-saving classes with scores of pupils in regular grades (author's class norms) for combined reasoning and computation tests in arithmetic, by grade—allowing time and a half.

Comparison of arithmetic quotients of sight-saving class pupils with their intelligence quotients, by grade.

pupil it seems reasonable to allow plenty of time. While some pupils may not need it, perhaps some few cases of extremely low vision should be allowed more than time and one-half.

It was decided, in view of these results, to repeat the tests in June, 1934, allowing time and one-half. This time the results were scored only for the extended time.

Chart 1

INTELLIGENCE TEST AND ARITHMETIC TEST—TIME AND A HALF—1933

Median arithmetic quotients of sight-saving class pupils, compared with their median intelligence quotients, by grade.

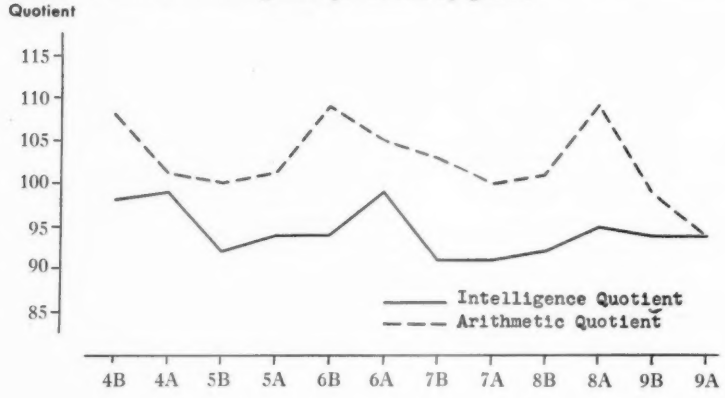
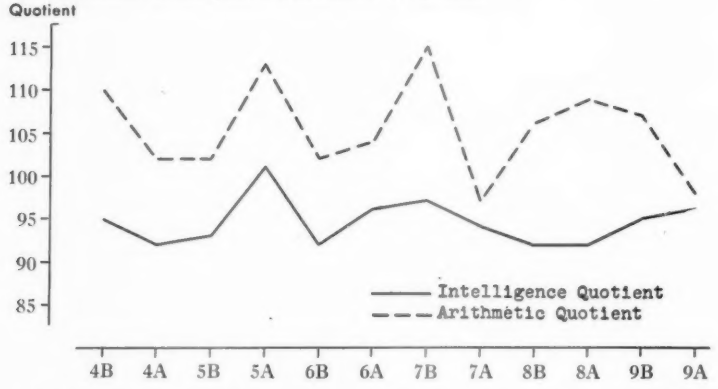


Chart 2

INTELLIGENCE TEST AND ARITHMETIC TEST—TIME AND A HALF—1934

Median arithmetic quotients of sight-saving class pupils compared with their median intelligence quotients, by grade.

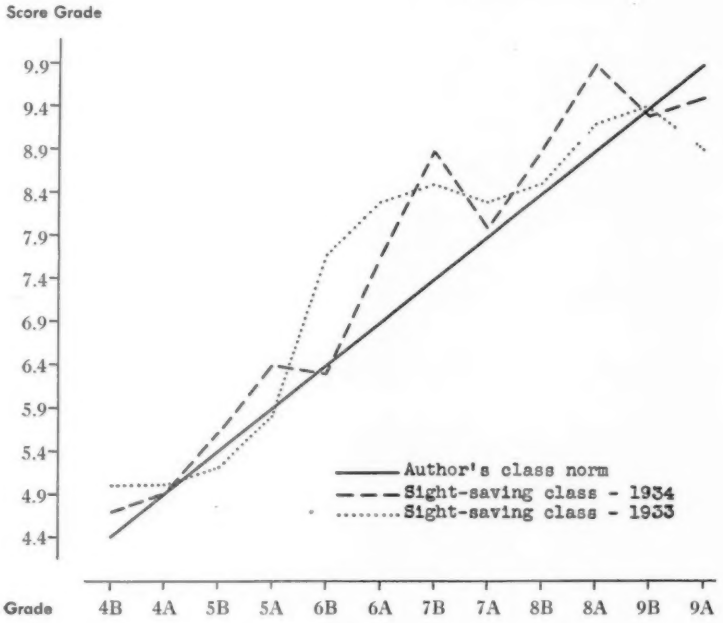


The results for 1934 indicate that the sight-saving median class standings compare favorably in most cases with the author's norms. (Table III.) A comparison of median arithmetic quotients with the median I.Q's. shows that these children succeed in arithmetic in terms of their mental ability. (Table IV.)

Chart 3

ARITHMETIC TEST—TIME AND A HALF—1933 AND 1934

Median arithmetic scores of sight-saving class pupils in 1933 and in 1934, compared with author's class norm, by grade.



The most interesting uses of the results of these tests were in teacher conferences. An individual record is kept of each child, with his mental age, arithmetic age, reading age, and dictation age, according to the Stanford Achievement Tests in those subjects. A conference was held with every teacher in which the achievement of each child in 1933 and 1934 was discussed. The child's mental age and his arithmetic age and the amount of growth in arithmetic for the year were considered and recommendations made in accordance with the findings.

In checking over the gain made by each pupil it was found that the average gain in arithmetic age per pupil from June, 1933, to June, 1934, was nine months.

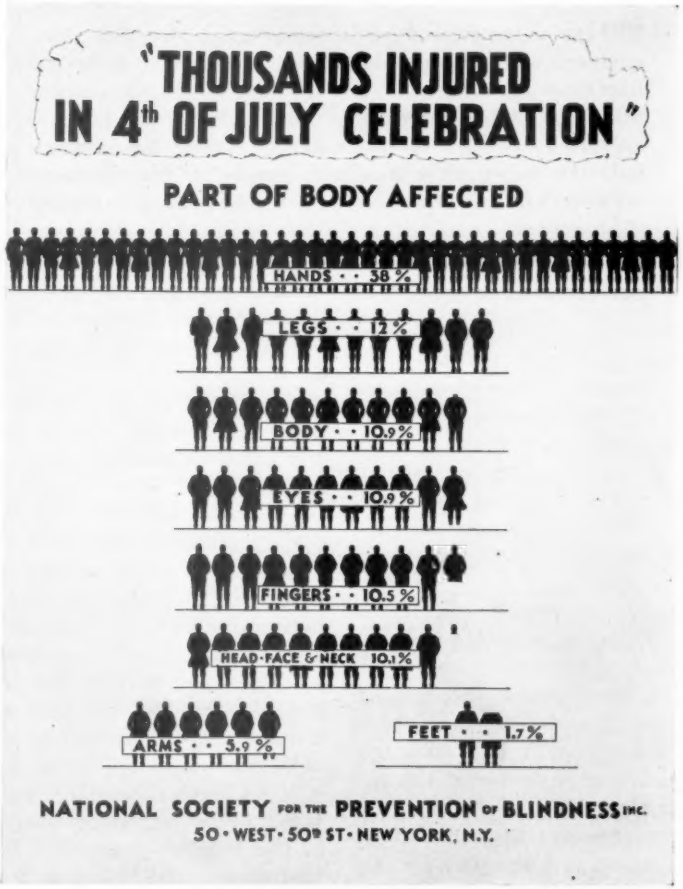
The results of these tests seem to lead up to much the same conclusion as the reading tests—namely, that these pupils work up to the limit of their mental ability, when given enough time and when material is in a form which they can see, regardless of the eye defect. Doubtless, much of the difficulty which these children have in arithmetic in regular grades is caused by inaccuracy in copying from blackboards and the difficulty in reading small type material where difficulty in distinguishing small numerators and denominators in fractions and small signs adds to their forming faulty number concepts.

Perhaps, in closing, it would be well to add a word of caution in connection with this testing program. In checking up on achievement, we must not lose sight of the child's eye condition, and pressure should not be brought to bear by administrators upon either teacher or pupil to the extent that, in an effort to keep up his academic achievement, he is using his eyes too much.

However, through improved teaching techniques, it should be possible to save these children from inefficient learning. Our aim should be to reduce wasted eye effort through the study of effective teaching methods.

Editorial

July Fourth—A Celebration or a Tragedy?


"THOUSANDS INJURED IN 4th OF JULY CELEBRATION"
PART OF BODY AFFECTED
HANDS · · 38 %
LEGS · · 12 %
BODY · · 10.9 %
EYES · · 10.9 %
FINGERS · · 10.5 %
HEAD·FACE & NECK 10.1 %
ARMS · · 5.9 %
FEET · · 1.7 %
NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS INC.
50 · WEST · 50TH ST · NEW YORK, N.Y.

Upon request, this poster is available in red, white and blue, size 22″ x 18″, for exhibit purposes

The Forum

THIS section is reserved for brief or informal papers, discussions, questions and answers, and occasional pertinent quotations from other publications. We offer to publish letters or excerpts of general interest, assuming no responsibility for the opinions expressed therein. Individual questions are turned over to consultants in the particular field. Every communication must contain the writer's name and address, but these are omitted on request

Your Child's Eyesight*

Naturally, all parents are interested in preserving good vision for their children. They know that a child with defective vision is handicapped from the beginning to the end of his life. They realize that good vision plays an important part in doing daily school tasks and may influence their future success and happiness.

Under our present educational system, during school years, the demand on eyesight in book work and blackboard work is continuous. In later life the demands made on good vision in industrial, mechanical and professional fields are tremendous and even in the pursuit of our pleasures the demand for good vision is insistent. For example, good vision is required to secure a license to operate an automobile or airplane, to play tennis or golf, and to enjoy the movies.

The State of New York, and other states as well, has recognized the tremendous importance to its future citizens of good vision. This State has shown its interest by placing on its statute books laws requiring the yearly testing of all school children's eyes so that any defects in vision may be discovered at an early age when most defects can be corrected and permanent loss of vision prevented. Parents are given a note of warning when defects of vision are found.

It has been assumed that parents would follow the advice contained in the warning note which states that they should consult with their family physician in regard to the properly trained specialist for the complete examination of the child's eyes, for treatment, and for the use

* Excerpt of radio talk given over Station WHAM, under the auspices of the Medical Society of Monroe County, New York.

of glasses when these are necessary. Attention is called to the fact that the school physician only advises of possible eye defects, and that co-operation on the part of parents is necessary in order to find out exactly what the real trouble is and how best to treat it. Co-operation consists in having the child's eyes properly examined by an eye physician of the parents' own choice and then in seeing that the advice is followed and glasses worn when ordered.

It is important for all parents to understand how good vision may be preserved and how defective vision may be corrected. There are three important conditions which materially aid in preserving good vision in school children. These are: good light, good print, and good health. The first two may be obtained at will and at little cost. Science and industry have provided us with very adequate light so that there is no excuse today to risk or ruin one's sight because of poor light. The best light is that which is sufficient to make the contrast between the black print and the space between the letters stand out clearly and sharply. The light should be without shadows, without glare, and without flicker. The proper amount of light is that obtained from a 60-watt frosted bulb placed 16 to 20 inches away from the printed page. A 100-watt lamp is required when the lamp bulb is 2½ to 3 feet away. All light should fall on the printed page and not directly into the eyes. This is accomplished by proper position and shading, the light being so placed that it falls from above or slightly behind and over the left shoulder. One sees by reflected light, that is, by that which comes from the printed page. Light which falls directly in the eye exhausts our retinal strength, causing eyestrain.

The second important condition for the preservation of good vision is good print. Fortunately much attention has been given to this subject during the past 25 years and today there is little or no criticism of the print in our textbooks. The print used in school books is good and properly adapted to the various grades in school, but many books read by school children out of school are badly printed. Parents must see to it that their children read well-printed books with fairly large type.

The third condition for maintaining good vision is first in importance and cannot be bought. This is good health. Good health refers to good general bodily health as well as to good eye health. And the one depends to a very large extent upon the other. With good general health, one nearly always starts out at least with good eyes, and poor health may mean poor sight. Therefore, in order to preserve good vision in normal eyes, it is most important to keep strong and well

and to correct all general health defects.

The eye is a marvelously delicate and a most complex organ, able to take twelve to fourteen perfect pictures every second and to send on the complete pictures for the brain to interpret. This requires precision and a perfectly working organism. In order to get good pictures, the eye, like the camera, must be in focus and, further, the transmitting apparatus must work efficiently.

If it is important to have good light, good print, and good health, in order to preserve good vision in normal eyes, it is even more important that these conditions should be met when the eye has some defect. Fortunately, about 80 per cent of school children in the lower grades have normal eyes, and only 20 per cent defective vision. These defects generally lie in a faulty focus which can usually be corrected by glasses, by treatment, or by correcting health defects. It can be easily understood that if the eye is out of focus because of its structure or shape or imperfect function, good or perfect pictures cannot be made on the retina. Blurred, distorted or imperfect pictures cause confusion, strain, and nervous upset. Therefore, it is of the utmost importance to make the eye focus the print or other images clearly and without too great effort. With an eye out of focus, good light, good print, and an otherwise healthy eye cannot produce good vision. The child with defective vision who is compelled daily to use his eyes not only undermines his health but risks further damaging his already defective eyes. Since glasses and proper treatment can correct most of these defects, corrections should be made before permanent damage is done.

The strain and pull on the eye in its efforts to overcome these defects commonly result in two harmful changes in the eye itself. First, the ocular muscles are often thrown out of balance; and second, the eye is stretched out of shape. In the first instance, the child becomes cross-eyed or wall-eyed, and when this condition remains too long, it often causes the vision in one eye to fail. A vicious cycle this—first, a continuous strain; second, a crossing or turning of the eyes, and then the partial or nearly complete loss of vision in the turned eye.

The second condition, the stretching out of shape of the eyeball, which very often takes place from the straining of defective eyes, is nearsightedness, a condition in which distant objects cannot be seen distinctly. In the stretching process, the eyeball becomes too long or deep and this may cause damage to the delicate structures within the eye, resulting in some permanent, incurable loss of vision. Under these conditions, there is again established a vicious cycle: first, a severe straining of ocular

structures, second, a stretching or giving away of ocular walls, third, nearsightedness, and finally some damage to delicate nerve tissue with partial loss of vision.

Both of these conditions, cross-eyes and nearsightedness, can, to a very large extent, be prevented; or if found and cared for early, they can be corrected. Only rarely are children born with cross-eyes and they are never born near-sighted. The early correction of these conditions will prevent serious complications or loss of vision.

In addition to the possible changes that eyestrain may cause in the eye itself, strain combined with poor vision has a bad mental effect. Generally children who can see the print of their books or the blackboard only imperfectly, or with much effort, soon get tired, lose their interest and get discouraged because they cannot get their lessons as quickly as their companions. They do not understand why. Sometimes they are thought to be stupid, or lazy, or indifferent, or all three combined. It is no wonder that sometimes they hate school and become backward or problem children.

In children, eyestrain is insidious; that is, children in the majority of cases do not have severe symptoms. They themselves, are not conscious of any eye trouble. Headache or eye fatigue is seldom complained of. Eyestrain may be discovered by a combination of some of the following symptoms or signs: red eyes, watery eyes, cross-eyes, squinting or scowling, awkward tilting or twisting of the head, holding the book close to the eyes, sensitiveness to light, nervousness, inattention, lack of concentration, subnormal sharpness of vision. This later sign is the best guide, but usually this requires testing, such as is given by the school nurse or physician. If all children could have their eyes thoroughly examined before six years of age, early eye defects would be discovered and many ocular complications prevented, provided the proper treatment were followed.

Parents may prevent eyestrain in their children by seeing to it that they use proper light and good print, and wear glasses, when recommended. If they follow the doctor's advice and do all they can to keep their children in good health, eyesight can be preserved, and most natural defects, often trivial at first, may be overcome and serious complications prevented.

A. C. SNELL, M.D.
Rochester, N. Y.

Communication

Enforced Wearing of Goggles

Editors' Note.—Readers of the REVIEW will be interested in this account of the difficulties which sometimes beset safety engineers in enforcing protective measures for employees. This letter was received by the National Society for the Prevention of Blindness; the name of the company is omitted by request.

Referring to your letter of the 19th inst., addressed to our Safety Director, beg to advise that the news item concerning the strike of our miners over the question of compulsory wearing of goggles was correct. There was a strike that lasted for three days, over the enforcement of the following clause in our agreement with the representatives of our employees:

"It shall be optional with the operator to require certain or all employees to provide themselves with and to use safety hats and/or safety shoes and/or safety goggles of an approved type. The men shall be *required* to wear goggles when using a pick, when breaking rock or slate, when chopping timber and in such other cases as shall be mutually agreed upon by the mine management and the mine committee."

The outcome was that the men returned to work and wore goggles as provided for in our agreement.

We were able to show that since 1929, when a campaign was started for the wearing of goggles, we have considerably reduced our eye accidents which, in 1926, totaled 396:

In 1930 we had 140 eye accidents
In 1931 we had 55 eye accidents
In 1932 we had 27 eye accidents
In 1933 we had 25 eye accidents
In 1934 we had 75 eye accidents

The increase in the 1934 figure is due entirely to the refusal of workmen to obey most safety rules and regulations in all lines of endeavor. We have not had a lost eye case since 1930, and we believe we have been justified in insisting upon our men wearing goggles for their own protection.

Note and Comment

Vision and Driving Safety.—"Is defective vision directly responsible for certain automobile accidents? Or is defective vision indirectly responsible for inefficient driving that leads to accidents?" asks Alvhh R. Lauer in the March issue of *National Safety News*. He has found, through experimental studies on the rôle of vision in automobile driving, that low visual acuity does not necessarily make an accident-prone driver, for the man who is aware of his condition drives more carefully to compensate for his defect. Low visual acuity in one eye, however, is a much greater hazard, since the poor eye may become functionally blind for some periods, and the field of vision thus limited. Persons having contracted visual fields, muscular imbalance, night blindness, or holes or spots in the vision represent definite examples of accident-prone drivers. Indirectly, however, visual defects exert a great influence upon the incidence of accidents, in that the person with a visual defect becomes more quickly fatigued and nervous, his judgment of distance is faulty, and glare presents a greater menace to him than to those with normal vision.

Save the Eyes in Childhood to Reduce Blindness.—"The chances of becoming blind are highest in the first two years of life," said Dr. M. Van Duyse, of Belgium, at the annual meeting of the International Association for Prevention of Blindness in London, in his talk on "International Classification of the Causes of Blindness." Ophthalmia neonatorum and corneal lesions are still responsible for the high proportion of blindness in the early years of life. His plea for accurate information on causes of blindness was backed up by Dr. A. Franceschetti of Switzerland, who felt that to prevent blindness from hereditary eye diseases, facilities should be made available everywhere for the sterilization of those who have hereditary eye diseases. Other measures to reduce blindness from hereditary causes included: premarital certificates of freedom from such diseases; the special training of physicians in genetics; the education of public health officials and the general public in this

subject; a decrease in consanguineous marriages; the collection of precise and complete statistics; and the increased use of social workers in this field.

Attending the meeting in London were representatives of nearly all the thirty-four countries affiliated with the International Association; because of the illness of Dr. de Lapersonne, president of the Association, the meeting was presided over by Dr. Park Lewis, of Buffalo, New York, vice-president of the International Association. The American National Society was represented further by Mr. Lewis H. Carris, managing director, and Mr. David Resnick, director of publicity.

Testing Visual Acuity.—A projection apparatus by means of which the optimum conditions for testing visual acuity may be applied is described by Drs. C. E. Ferree and G. Rand in the December issue of the *American Journal of Ophthalmology*. The instrument, an inexpensive projectoscope, may be equipped with the usual testing slides, or may have tests devised by the physician for the special diagnosis of the patients' acuity and color sense.

Eye Hazards in the Oil Industry.—In discussing health hazards in industry at the annual meeting of the American Public Health Association, Dr. R. A. Jewett stated: "For years, I have been impressed by the great amount of relief obtained from physical symptoms by proper treatment of the eyes." A survey of the vision of men employed in one oil company showed that 30 per cent had subnormal vision, and seven per cent had pathological eye conditions. A special eye hazard for filling station attendants is the irritation to the eyes of acids used in cleansing car springs and lubricating racks.

London Squint Clinic.—Twenty years in a London clinic for the treatment of squint has proved to A. Marian Thornett, ophthalmic surgeon, that squint is nearly always successfully corrected and vision in the squinting eye restored through orthoptic training, supplemented by other types of treatment, such as refraction and occlusion. Gaining the co-operation of the parents and the confidence and enthusiasm of the child are important steps in bringing treatment to a successful conclusion.

Prenatal Treatment, Visual Safeguard.—Among a group of mothers cared for at one hospital, 84 cases of gonorrhea were discovered and treated during pregnancy; none of the babies born to these women developed ophthalmia neonatorum, although gonorrheal ophthalmia did develop in the eyes of babies born to 15 women in whom there had been no evidence of gonorrhea and who had had, consequently, no prenatal treatment. In both groups of babies, the same precautionary drops of silver nitrate had been used at birth. The conclusion is reached by Drs. J. Bernard Bernstine and Mario A. Castallo, who report the records in the January 15 issue of the *Medical Record*, that treatment of the mother during pregnancy is important in the prevention of ophthalmia neonatorum. A further contribution to the prevention of ophthalmia neonatorum made by Dr. Castallo and Dr. P. Brooke Bland, and described by them in the March 23 issue of the *American Medical Journal*, is the eyelid retractor which facilitates the instillation of nitrate of silver in the eyes of the newly born infant. The instrument, which was first introduced in 1933, has been modified for greater security; its blades are so shaped that, when placed over the closed eyelids and gently separated, the eyeball, with the conjunctival sac, is exposed without the slightest trauma. Hence, free instillation of the antiseptic solution is assured.

Industrial Safety in Australia.—The right goggle for the special type of job is important in saving sight from industrial accidents, says a note in *Safety News*, official organ of the National Safety Council of Australia. Specifications are given for the proper protective devices and goggles for chipping, arc-welding and other eye-hazardous positions.

Muscle Balance, a Delicate Factor in Performance.—The fact that the mind can interpret only the impressions it receives, and that faultless sensation must precede accurate perception, has too frequently been overlooked in educational research, says Emmett Albert Betts in a recent issue of *Educational Research Bulletin.* While reading readiness is dependent to a large extent upon mental maturation, normal visual sensation and perception are also prime requisites. Mr. Betts declares that a certificate of visual readiness

to read should be required of all first grade children, and he describes a technique and apparatus for testing the oculomotor habits, faults of which, even more than of visual acuity, lie back of obscure inability to read after the stage of mental readiness has been reached.

Not only are perfect binocular vision and ocular muscle balance of particular importance in reading, but "it has now been proved beyond argument that lack of true ocular muscle balance is the most common cause of error in judgment in bringing an aircraft to the landing ground," says the third edition of the *Medical Examination for Fitness for Flying*, published by the British Air Ministry. Licenses for private pilots may now be obtained by those whose vision is less than 20/20, but correctible by glasses to that point; commercial pilots *must* have normal vision and perfect muscle balance.

Reduction of Hereditary Blindness.—The proportion of blindness caused by hereditary factors is still problematic; figures are quoted giving the percentage as all the way from a third of all blindness to less than five per cent. At a medical meeting in Freiburg, Germany, Prof. W. Wegner declared that persons who can trace their blindness to heredity make up some 20 to 25 per cent of the whole blind population. He recommends sterilization of such people, and goes farther in demanding that the sisters of men with Leber's disease also be sterilized, since the disease is frequently carried through the female to her male offspring. The intermarriage of high myopes, according to Prof. Wegner, should also be prohibited. To procure data for eugenic measures, he recommends an ophthalmological census of Germany's blind population.

Health Education in Rural Chinese Schools.—In developing a program of health education in rural schools in China, the Department of Public Health of the Chinese National Association of the Mass Education Movement made trachoma detection and treatment a first point of attack and a demonstration project. Seventy-five per cent of the 1,255 children examined in a rural school district were found to have trachoma; after a two-months' demon-

stration of the effectiveness of treatment, the improvement was so marked that teachers in whose hands the continuance of the treatment was placed needed no further prodding in keeping up treatment, and parents showed greater co-operation. The success of the trachoma campaign opened the way to a health education program to promote cleanliness in the school, in the individual, and in the home environment, and to promote the practice of health habits.

National Conference of Social Work.—Medical social eye workers will, as usual, hold their annual luncheon meeting during the National Conference of Social Work which takes place this year in Montreal; the meeting is called in co-operation with the American Association of Medical Social Workers and the National Society for the Prevention of Blindness. "Syphilis and the Eye" is the theme of this year's meeting, and special topics will include: "Eye Complications of Syphilis"; "What Can the Social Worker in a Syphilis Department Do to Prevent Loss of Sight?" and "An Eye Social Worker's Relation to the Syphilis Department."

During the National Conference of Social Work, provision will be made for consultation services, in the Sun Life Building. There, fifty or more national public and private agencies, of which the National Society for the Prevention of Blindness is one, will have attractive accommodations for displaying their publications and meeting their friends, answering questions and holding consultations, serving all who wish to get help on their problems. Mrs. Eleanor Brown Merrill, an associate director of the Society, will be its representative during the conference.

New Ophthalmological Society in China.—The Tsian Ophthalmological Society, organized in January, 1935, held its first meeting at Cheeloo University School of Medicine; Dr. Eugene Chan, formerly a member of the staff of the Wilmer Ophthalmological Institute, and now head of the Department of Ophthalmology at Cheeloo, presided at the meeting.

Sight-Saving Class in Paris.—Although the first attempt to open a sight-saving class in the Parisian school system did not meet with

success, determined effort on the part of the French Committee for the Prevention of Blindness has resulted in the formation of a class in Paris for children with seriously handicapped vision.

Is Trachoma Infectious?—Human trachoma is transmissible to monkeys, according to experiments carried out in the bacteriological laboratories of the Oscar Johnson Institute at Washington University School of Medicine, but the two clinical complications of human trachoma—cicatrization and degenerative changes in the cornea—are lacking in the infection arising in the experimental animals. The experimenters, Drs. L. A. Julianelle and R. W. Harrison, conclude that the evidence obtained in this study fails to confirm the opinion that the infection following inoculation of trachomatous tissue represents either human or simian folliculosis.

Dr. Wilder Honored.—The Leslie Dana Medal, awarded annually for outstanding achievements in the prevention of blindness and the conservation of vision, will be presented this year to Dr. William H. Wilder of Chicago. Dr. Wilder was selected for this honor by the National Society in co-operation with the St. Louis Society for the Blind. The medal, offered annually by a director of the St. Louis Society, is a prized mark of recognition of service for the conservation of vision. It bears the inscription: "Wise Clinician, Devoted Teacher and Humanitarian." Dr. Wilder is secretary-treasurer of the American Board for Ophthalmic Examinations; vice-president of the Illinois Society for the Prevention of Blindness; professor emeritus of ophthalmology at Rush Medical College, University of Chicago; and a past president of the American Academy of Ophthalmology and Otolaryngology.

Honor for Benefactor to Blind.—Because Robert E. Naumburg invented the Visagraph, a device for enabling the blind to read ordinary printed books without the aid of any other person, the Franklin Institute has awarded to him the John Price Wetherell medal for 1935. The medal is awarded annually for an apparatus original in its accomplishments, and of unquestioned benefit to humanity. The Visagraph automatically reproduces a magnified, raised copy of a printed page, which the blind can readily read with their fingers.

National Society Notes.—Staff members of the Society have utilized many opportunities to co-operate with allied organizations in conservation of vision. Mr. Lewis H. Carris, managing director, represented the United States and the Society at the annual meeting of the International Association for Prevention of Blindness in London; attended, with representatives of the Connecticut State Board of Education, in Hartford, the hearing on the bill applying for state aid for handicapped children; at the invitation of Bellevue Hospital, he talked to a group of internes and ophthalmological students on prevention of blindness; on a visit to Santa Fé, New Mexico, he addressed the annual meeting of the New Mexico Public Health Association which was held in conjunction with the annual meeting of the American Association for the Advancement of Science. Mr. Carris also participated in the panel discussion on the exceptional child held under the auspices of the United States Department of the Interior in Washington. He had the honor to present the Leslie Dana Medal to Dr. William H. Wilder at the St. Louis Society for the Blind's dinner in St. Louis. He was one of the speakers at the annual meeting of the Guild of Prescription Opticians in Rochester, New York.

Mrs. Winifred Hathaway, associate director, spoke on sight-saving classes, under the auspices of the City Board of Education, in Lexington, Kentucky; in Columbus, Ohio, she attended the Ohio Education Conference where she addressed the sight-saving class section. In co-operation with the Board of Education of Detroit, Michigan, Mrs. Hathaway participated in sight-saving week.

Mrs. Eleanor Brown Merrill, associate director, assisted in local prevention of blindness activities in Washington, D. C.; in Baltimore, where she spoke at the annual luncheon meeting of the Maryland Society for the Prevention of Blindness on "Sight Saving and the Community"; and in Pleasantville, New Jersey, where she talked on prevention of blindness in connection with National Negro Health Week. She will represent the Society during the National Conference of Social Work, in Montreal, early in June.

Continuing her demonstration and teaching work with the nursing profession, Miss Mary Emma Smith, R.N., director of nursing

activities, has visited nine cities in Iowa and South Dakota, where she held round-tables on prevention of blindness for public health nurses. She also attended the institute for nurses held by the Minnesota State Department of Health in Minneapolis.

Bringing eye health to the attention of educators has taken Dr. Anette M. Phelan to New Jersey State Teachers College in Trenton; to City Normal School in Syracuse, New York; to State Normal School in Cortland, New York; to the University of Chicago; to the National College of Education in Evanston, Illinois; to Indiana University in Indianapolis, to the University of Indiana, in Bloomington; to the Louisville Normal School in Louisville, Kentucky; and to Morehead State Teachers College in Morehead, Kentucky.

Mr. Louis Resnick, director of industrial relations, who has particularly interested himself in the prevention of accidents from fireworks and toy weapons, testified for the Maryland Society for the Prevention of Blindness in favor of legislative bills restricting the sale of air-rifles and fireworks.

Co-operating with the New York Tuberculosis and Health Association, staff members of the Society have talked over the radio on prevention of blindness topics. Mrs. Hathaway discussed "The Miracle of Seeing Eyes"; Miss C. Edith Kerby, statistician, described how "Foresight Saves Eyesight"; and Miss Isobel Janowich, editor, discussed "Eyes on Vacation."

Current Articles of Interest

Orthoptic Treatment of Concomitant Squint, Jacob B. Feldman, M.D., *Archives of Ophthalmology*, March, 1935, published monthly by the American Medical Association, Chicago, Ill. An account of the operation of an orthoptic training clinic gives some of the practical methods of bringing cases to a successful conclusion. The percentage of "cured" cases, while not conclusive because of the short time the clinic has been in operation, is encouraging. The author concludes: "Orthoptic treatment is not to be considered a cure-all or a rapid cure, but it has its place in ophthalmologic practice as a conservative, painstaking remedial measure, productive of successful results in a certain number of cases in which refraction and operation do not fully yield binocular vision with its ultimate result, stereopsis."

Ocular Dominance, L. F. McAndrews, M.D., *Archives of Ophthalmology*, March, 1935, published monthly by the American Medical Association, Chicago, Ill. Reviewing authoritative studies on eye dominance, the writer concludes: 1. The majority of human beings possess a dominant eye. 2. This eye is the right eye in more than 80 per cent of cases. 3. There is a direct relationship between the eye and the hand. 4. Practically all right-eyed persons are right-handed. 5. In testing with the Maddox rod for muscular imbalance, the rod should always be placed over the nondominant eye. 6. When prisms are prescribed, they should always be placed before the nondominant eye, if possible.

Ocular Complications of Gonorrhea, Charles M. Swab, M.D., *Journal of the Missouri State Medical Association*, January, 1935, published monthly by the Missouri State Medical Association, St. Louis, Mo. It is the duty of the attending physician to carry out prophylaxis for the eyes of the newborn, and to make daily inspection until both mother and child are discharged from his care, says the author, who recommends silver nitrate drops in the prophylaxis as the silver preparation of choice. He finds that even

where an ophthalmia does develop after the instillation of the drops, the disease is generally responsive to suitable treatment. He concludes that the best results in preventive measures are brought about through the intelligent co-operation of the physician, the attendants and the family.

The Management of a Case of Convergent Strabismus, Margaret Dobson, M.D., *American Journal of Ophthalmology*, March, 1935, published monthly by the Ophthalmic Publishing Company, St. Louis, Mo. The author gives a short account of the methods adopted in her private orthoptic training clinic and in the London County Council Eye Clinic, where she is in charge of the orthoptic training center.

Syphilis, the Most Costly of Communicable Diseases, W. Thurber Fales, Sc.D., and Ferdinand O. Reinhard, M.D., *Baltimore Health News*, February, 1935, published monthly by the Baltimore Health Department, Baltimore, Md. Although measles was epidemic in the city of Baltimore last year, a three-year comparison of the incidence of reported measles and reported syphilis shows that for 18,905 cases of measles, a high mark, there were 13,032 cases of syphilis. No other communicable disease could have such a high incidence without arousing the medical profession, the health department, the city authorities and the entire citizenry to action. Unlike measles, which is normally a brief and passing disease, syphilis accounts for 10 per cent of the deaths from heart disease, the leading cause of death, and 12 per cent of persons in institutions for the insane are there because of syphilis. The city of St. Louis spends between two and two and a half million dollars annually on the care and treatment of those having venereal diseases, says the report, and Baltimore undoubtedly spends a similar amount. A thoroughgoing public health campaign against this costly and destructive disease is urged.

Concerning the Recognition of Certain Symptoms and External Ocular Signs Referable to Various Diseases, Thomas B. Holloway, M.D., Published *Proceedings* of the International Medical Assembly, meeting at Philadelphia, November 5–9, 1934, reprint

published by the Joseph Schneider Foundation Fund, Dubuque, Iowa. A review of ocular symptoms discernible without ophthalmological instruments of precision: notably exophthalmos, ptosis, hemorrhage, tumors, pupillary signs, etc.

Recent Measurements of the Brightness of the Clear North Sky in Washington, D. C., James E. Ives and Fred L. Knowles, *Transactions of the Illuminating Engineering Society*, March, 1935, published monthly by the Illuminating Engineering Society, New York, N. Y. Presentation of results of some recent measurements of the brightness of the clear north sky in Washington, D. C., from 8 A. M. to 4 P. M., from May to November. Since the period from 8 A. M. to 4 P. M. covers, in general, the working day, and the months May to November during which the measurements were made are fairly representative of the whole year, it is believed that the information presented will be of value to the illuminating engineer and architect in the design of daylight illumination.

Glaucoma, Some Practical Considerations, Andrew J. Browning, M.D., *Northwest Medicine*, January, 1935, published monthly by Northwest Medical Publishing Association, Seattle, Wash. The author finds that the number of cases of chronic simple glaucoma that reach the ophthalmologist beyond the possibility of help by appropriate treatment is far too frequent, but the list could be materially lessened if the responsibility assumed by the family physician and refractionist were properly safeguarded by a diligent desire to see that such glaucoma-suspected subjects secure that ocular survey to which they are justly entitled.

Book Reviews

ATLAS FUNDUS OCULI. William Holland Wilmer, M.D. Introduction by Warfield T. Longcope, M.D. New York: The Macmillan Company, 1934. 100 color plates.

The year's, and perhaps the decade's, noteworthy contribution to ophthalmology is this *Atlas* of 100 full-sized illustrations of the ocular fundus, the production of which is the result of a lifetime of professional experience of one of the most renowned of ophthalmologists. He calls it "a modest volume" but it is exhaustive not only in pictorial expression but also in the descriptive text.

While some rare conditions are shown, the large majority consists of those which the ophthalmologist is likely to meet in daily practice, selected by Dr. Wilmer with the discretion and wisdom that comes of great experience. The histories are excellently epitomized, giving useful correlations of the pathologic lesions in the fundus with the general disease. The reviewer's main interest centers upon the accurate and brilliant reproduction of the pictures which has not hitherto been surpassed in any American or English publication, and which compares favorably with that in Celler's *Atlas* which was a very expensive publication and hence met with a comparatively small sale in America. While the illustrations are not directly the work of the author, he secured an artist who was competent with the ophthalmoscope in painting the appearances seen in the fundus. These reproductions of the fundus in color by brush were made by observation with the illuminating ophthalmoscope, the direct method being employed and the correctness verified by the Gullstrand binocular and Friedenwald ophthalmoscopes with the red light and red-free light.

A special lithographic process had to be evolved in order to bring out detail and the color values of the beautiful original paintings. Whereas, in the ordinary color work, four to six printings are made, in this *Atlas* the illustrations had to go through the press eight to sixteen times, a costly and laborious process; had it not been that part of the making of the plates was done prior to the rise in prices,

the subscription price would have been more than $35, for which it is now on sale.

This reviewer's opinion may perhaps be accepted as authoritative as he himself has worked for more than forty years in painting half a thousand or more ophthalmoscopic pictures which, owing to the great expense of reproduction, have not yet been brought forth in book form. "Art is long" but "time is fleeting," so perhaps in this lifetime another *Atlas* may not be published. Carlisle says, "Often I have found a portrait superior in real instruction to half a dozen biographies," and the Chinese maxim relates, "One picture imparts as much information as ten thousand words." So it is with this work; it will live for many years. It certainly will be found in all medical libraries and is well worth the price for the individual ophthalmologist.

HARRY VANDERBILT WÜRDEMANN, M.D.

OCULAR DIOPTRICS AND LENSES. G. F. Alexander, M.D. Baltimore: William Wood and Company, 1934. 216 p.

The reviewer must admit that he was very much disappointed on opening this book to find that it was a peculiar conglomeration of the theoretical and practical, in which the practical plays a very minor part, and in which the theoretical is presented by means of a great number of formulae. To the reviewer's mind, there is inadequate explanation to go with these formulae, and he believes the average ophthalmologist will gain little through study of this work unless he be particularly well equipped in mathematical lore. Lest the reviewer do injustice in his criticism, he must point out, however, that the author reminds us in his prefatory note that this volume may be considered as supplementary to two others which he has written. Could one have all three works before him, it may be that their interrelation would make evident the more direct usefulness of the present work.

JOHN N. EVANS, M.D.

Contributors to This Issue

As chief worker in the Social Service Department of the Massachusetts Eye and Ear Infirmary, **Miss Amy G. Smith** has played a leading part in the development of medical social eye work. She supervises the training of medical social eye workers in this section of the country.

The authors of "Fenestration and Natural Lighting" are: **Alfred H. Fletcher,** director of the Bureau of Sanitation in Memphis, Tennessee; **Dr. Theodore F. Foster,** formerly superintendent of health in West Hartford, Connecticut; and **Daniel H. Goodnow, Jr.,** experimental engineer, West Medford, Massachusetts.

Dr. T. H. Farrell is a practising ophthalmologist in Utica, New York.

Senior physicist in the United States Public Health Service, **Dr. James E. Ives** has particularly interested himself in problems of lighting in industrial occupations.

Dr. C. O. Sappington is consultant in industrial medicine; he was formerly director of the division of industrial hygiene of the National Safety Council.

As supervisor of sight-saving classes in northern Ohio, **Miss Olive S. Peck** has been especially concerned with the educational problems of sight-saving class pupils.

Among our book reviews: **Dr. Harry Vanderbilt Würdemann,** himself the author of several textbooks on ophthalmology, is a well-known contributor of reviews to the REVIEW; **Dr. John N. Evans,** another familiar contributor to these pages, is director of research at the Brooklyn Eye and Ear Hospital.